MODERN Machine Shop

HOWARD CAMPBELL, Editor

Volume 4 MARCH, 1932 Number 10

A Magazine for Machine Shop Executives

▲

Member Controlled Circulation Audit

Circulation More Than 27,500 copies.

CONTENTS

Published monthly by Gardner Publications, Inc., 128 Opera Place, Cincinnati, Ohio

DON G. GARDNER, President and General Manager

GEORGE H. MEYERS, Western Manager, Chicago
JOHN M. KRINGS, National Advertising Manager, Cincinnati
CHARLES G. ECKERT, Pacific Coast Manager, San Francisco

MODERN Machine Shop

MARCH, 1932

CINCINNATI, OHIO VOL. 4, NO. 10

"Ideas" From the N & W Shops At Portsmouth, Ohio

A number of valuable and interesting tools for saving time and labor have been developed by this organization.

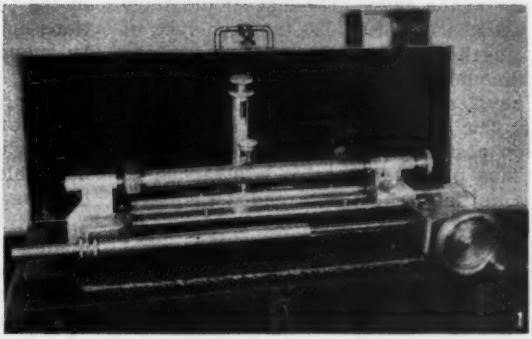
By PHILIP WINTER

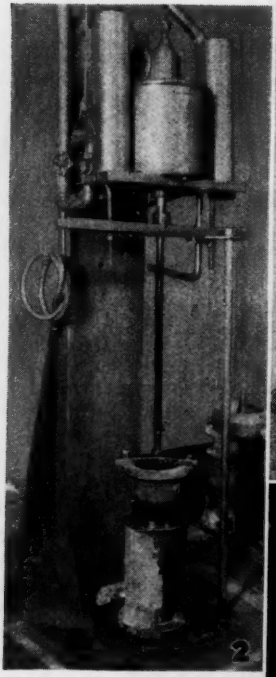
AMONG the most interesting of the railway repair shops that have been inspected by the writer are the shops of the Norfolk & Western Railway at Portsmouth, Ohio. While a large part of the work is performed by orthodox methods, it is evident that precedent has been discarded. The number of tools and machines that have been designed for the saving of time and labor and for the furtherance of accuracy is large, and many of these tools should be of interest to the executives in other railway shops.

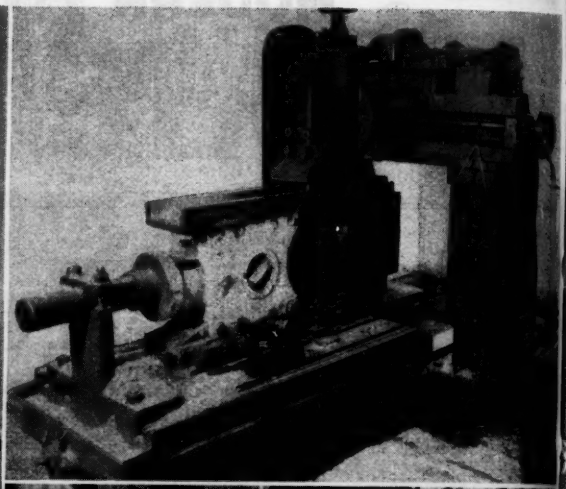
It is interesting to note that the desks of the department foremen, together with that of the general foreman, are all located in one room. Here the desks are aligned in two rows, end to end, which makes it convenient for the foremen to consult each other or to hold a general conference without the necessity of leaving their desks.

Among the finer tools developed and built by this organization is the gage for testing the taper and concentricity of frame bolts. These bolts are from 3 in. to 18 in. in length and, when finished, have a taper of $\frac{1}{8}$ in. to the foot. In this shop these bolts are finished to size by grinding, the diameters being held to a limit of 0.0025 in. After finishing, each bolt is placed between the centers of the gage, shown in Fig. 1, the dial indicator is lowered until it makes contact with the bolt,

Fig. 1—Gage for checking taper and concentricity of frame bolts.







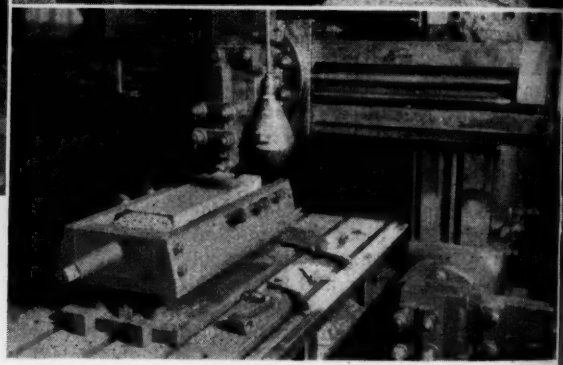


Fig. 2—Device used to lap-in rings in steam pipe slip joints for Mallet-type locomotives. Fig. 3—Machining guide fits on cross-heads, using a Newton crank planer. Fig. 4—Shoes and edges are machined with this equipment.

and the bolt is passed back and forth under the gage. The dial should show a variation of 0.0026 for each inch of length; thus it is easy to figure the amount of taper required on a bolt of any length.

The centers of the gage are located on a sliding table that is keyed to a base plate. The table is attached to a nut into which is threaded a square-thread screw that is revolved by means of the hand wheel at the right front of the tool, bevel gears being used to transmit the power. A graduated disc on the screw is also located inside the box, which has an opening in the top through which the graduations may be read. Thus the bolt can be moved any given distance and a reading taken from the dial. The indicator is attached to a nut that is raised or lowered by turning the screw upon which it is threaded. An individual table and sheet metal cover keep the gage clean and in good condition.

Another interesting piece of equipment is the machine shown in Fig. 2, which was devised to lap-in the rings in steam pipe slip joints for Mallet-type locomotives. The sleeve is held

in an old lathe chuck that is mounted on a spindle which both rotates on ball bearings and rests on a ball thrust bearing. The mechanism by which the inner, or male, section of

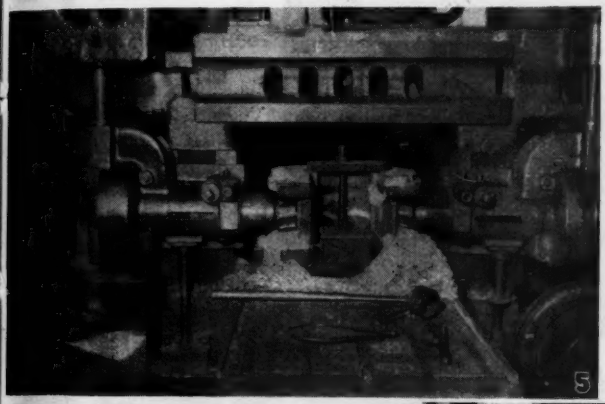
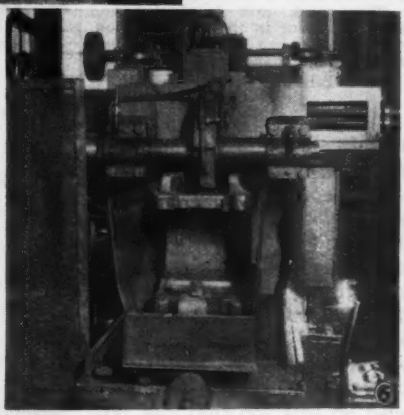


Fig. 5—Milling driving box faces after new bronze liners have been cast in place. Fig. 6—Closer fits and a better job are obtained by grinding the pedestal faces of driving boxes. This grinding machine was converted from an antiquated planer.

the joint is reciprocated is mounted on a section of 12-in. steel channel, anchored vertically in a concrete foundation. This mechanism consists of the steam end of a 9½-in. air pump, with a special piston rod of the necessary length. The apparatus is operated by air from the shop air-line. With each return stroke of the piston, the chuck is indexed by means of a connecting rod that operates a ratchet, the return movement of the ratchet being obtained by the pressure of the coil spring shown at the rear of the vertical column. This piece of equipment requires very little attention, as the parts can be set up and the machine left to itself while the operator takes care of other work. A better joint can be obtained by lapping-in in this manner, and one that will hold up longer. In addition to this, the possibility of steam leaks is considerably reduced.

Guide fits on crossheads are machined with the machine shown in Fig. 3, which is a 36 - in. Newton crank planer that has been set down into the floor to a depth which located the table at a convenient height for the operator. The crosshead is held in place by means of a mandrel that extends all the way through the piece and is long



enough so that it can be supported at both ends. Although but one piece is machined at a time, this type of planer is much faster than the type of machine usually used for this job, the average time for planing a crosshead of the design shown in process being 45 minutes. This crosshead is for a large mountain-type locomotive.

Another 36-in. Newton crank planer that has been set down into the

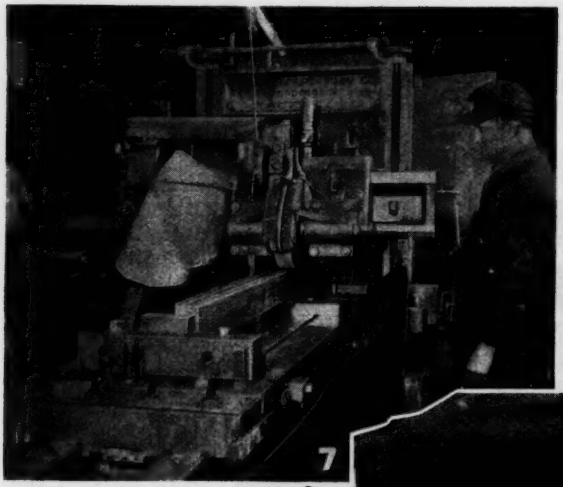
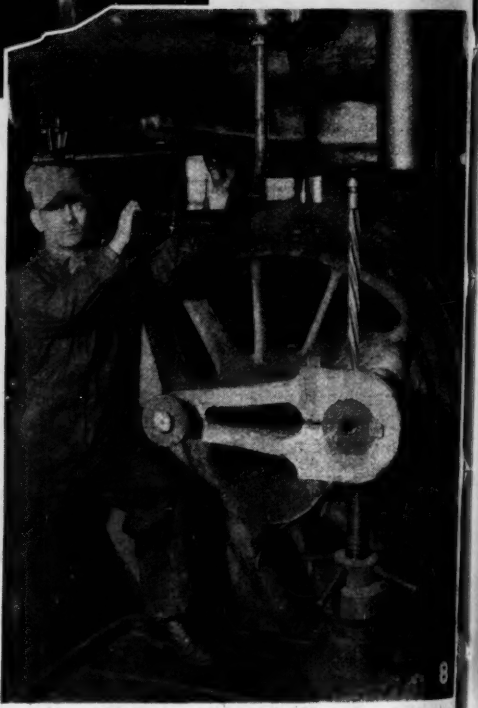


Fig. 7—Surface grinding machine converted from a 24-in. planer. Fig. 8—The crank arm is drilled and reamed in place in the machine shop, where the job can be handled to better advantage than would be possible on the erecting floor.



floor is shown in Fig. 4. This machine, as shown, is equipped with a special jig for machining the faces of driving box shoes and wedges, after laying off, one piece being machined at a time. As in the case of the machine described in the preceding paragraph, this planer is so much faster than the usual type of machine used on this job that the production time, although but one piece is machined at a time, is considered very good. An "O. K." toolholder and tool are used on this job, the face of the shoe or wedge being machined and the radius cut without changing the tool. Machining time, floor to floor, is 20 minutes for cast iron or 35 minutes for a steel shoe.

When the pedestal faces of driving boxes become too badly worn for further use, the old bronze is stripped off and new bronze liners are cast on, then the liners are machined to the proper dimensions by milling with the equipment shown in Fig. 5. The machine is a planer-type miller, and the cutters are of the exact size necessary to produce the correct dimensions between faces. With the cutters set at the correct distance apart, the two faces are machined to finish size in one cut. A smooth and accurate job is obtained on this operation.

In Fig. 6 is shown a 26-in. Newton planer that has been converted into a surface grinder. The job in process is that of grinding the pedestal faces of a driving box for the shoe and wedge fits. This box has a steel face. The task of converting the planer into a grinder was comparatively simple; a heavy plate was mounted on the crossrail, the plate carrying large bearings for the wheel spindle. Provision was made for mounting a grinding wheel in the center of the shaft, as shown, and a pulley was placed on the end so that the wheel-shaft could be driven from a motor. It is said that the grinding of these surfaces not only produces a more accurate job, but the finish provides for better lubrication, reduces the amount of wear in a given length of time, practically eliminates the possibility of a wedge sticking, and thus guards against the danger of a hot driving box.

Another surface grinding machine that has been converted from a 24-in. planer is shown in operation in Fig. 7. In this case the wheel-shaft is driven from a motor that is located under the machine. The grinding wheel is mounted on its shaft between two bearings on the head on which the shaft is carried, and the pulley end of the shaft runs in a bearing of the outboard type, with the pulley located between the bearing and the grinding wheel head. The pulley is mounted on a sleeve that is splined internally to receive the wheel-shaft, which is splined to fit. Thus the wheel can be fed across the width of the table while the wheel-shaft pulley remains in alignment with the motor pulley. The bearings are of bronze, and are of ample size.

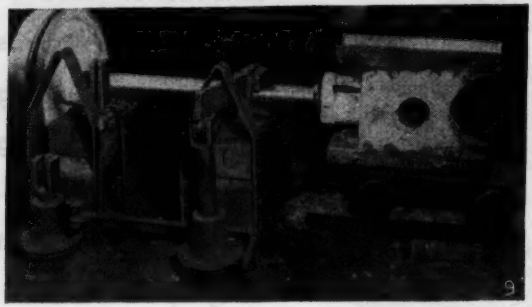


Fig. 9—This equipment saves a lot of time and labor in assembling the crosshead to the piston.

Across one end of the shop is a single line of machines which includes the wheel lathes, quartering machine, and the large radial drill press shown in operation in Fig. 8. The job shown in process is that of drilling and reaming the crank arm in place so that when the wheels arrive on the erecting floor, the crank arm can be assembled to the crank pin with no further fitting or drilling. As each set of main wheels comes from the quartering machine, the crank arm is keyed in place, the hole for the bolt is drilled and reamed, and the bolt is applied. The operation is performed much easier by this method, and the job is just as accurate.

In Fig. 9 is shown a device which saves a considerable amount of time and labor on the operation of assembling packing to the piston, trying the crosshead, and fitting the key. The piston and piston rod assembly is laid across two supports and clamped in place by means of an air-clamp made of a bar of iron, hinged at the middle and actuated by the piston of an air cylinder, as shown in the illustration. The cylinder is an 8-in. car brake cylinder, mounted on a base

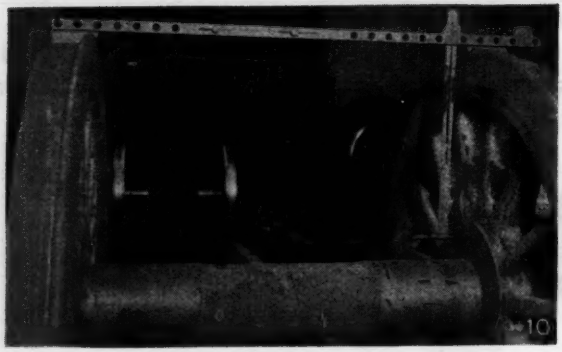


Fig. 10—Gage for checking hub liners on driving wheels.

consisting of a section of 12-in. channel iron set into a concrete foundation. Two of these clamps are provided, as shown, although it has been found that one is usually sufficient.

The crosshead that is to be fitted to the piston rod is set onto a "wagon" made of a section of heavy channel 30 in. long, mounted on four wheels of 7 in. diameter and grooved to ride on the edges of two sections of angle iron which comprise the track. The track is 6 ft. long, affording plenty of room to move the crosshead back and forth. This apparatus makes it easy to slide the crosshead over the end of the rod, while fitting the key, without the heavy lifting that is usually required on this operation, and is a good safety measure.

A set of driving wheels is shown in Fig. 10, with a gage that is used for checking the liners to see that there is the same amount of stock on each side of the wheel. As shown, the measurement is taken from the flange. If the stock is heavier on one side of the wheel than on the other, it has a tendency to crowd the wheel over to one side, which results in abnormal wear on the flange. The vertical section of the gage can be adjusted according to the diameter of the wheels, and the horizontal section can also be adjusted and locked by means of two thumb-nuts. A micrometer head through the end of the vertical arm provides for exact measurement. This gage can also be used to check liners on truck wheels without outside journals by inverting the vertical arm.

(This article will be concluded in the April issue.)

Catalog of Parker-Kalon Products

In this, the third edition of the Parker-Kalon catalog, complete information and technical data is presented regarding the use and application of the hardened, self-tapping sheet metal screws, Monel hardened self-tapping screws, hardened metallic drive screws, hardened screwnails and hardened masonry nails made by Parker-Kalon Corporation, 200 Varick St., New York, N. Y.

The text gives instructions for the use of these various screws and nails, and includes photographs and drawings, in color, to illustrate the instructions. Among the photographs are a number showing actual installations and commercial products upon which the screws and nails are used by the manufacturers. Special tools to facilitate the use of the screws and nails are also described and illustrated.

Graphs are provided to illustrate the comparative strength of fastenings under tension and under shear, and tables give full information as to the sizes of holes required in metal of various thicknesses for the different sizes of self-tapping screws. The book closes with a number of tables that will be useful to users of sheet metal fastenings. The book is 8½ x 11 inches in size, and contains 30 pages. A copy will be sent to any design engineer or production executive who will address his request on his firm letterhead.

Keeping An Unemployment Score

By E. E. BURKE, *Manager*
Kent-Owens Machine Co., Toledo, Ohio

WE TALK a great deal about stabilizing business. It is an important subject. Students are devoting much time to the study of business cycles and we are getting some facts on commerce in general and on prices that ought to be useful.

But stabilization cannot come from above; it must come from below. When each unit, from the shop employing half a dozen people to the great institution employing thousands, takes in hand the better ordering of its own affairs, then will we be actually started toward general stabilization and the prevention of widespread unemployment.

Unemployment is, of course, only a result; it is not a cause. And schemes for the alleviation of unemployment that start with the provision of work for men are more apt to hurt than to help, for they start at the wrong end and lead thus to more unemployment.

But what must impress every student of business—and every man in business ought to be a student—is that, in spite of all the talk about stabilization, the average business has no method by which it may compute its own stabilization—much less compare its record with the record of other units in the same line. Just as soon as we can get men comparing their records we shall be making progress.

And the question is bound to come up in another way—a way that will make records imperative, for only through these records can we really discover what a plant is worth. That is a question that is now seeking an answer. Bankers are beginning to learn that although the amount of quick assets is a basis for lending short time money, and the earnings over a period determine to a large extent the value of the stock, yet neither of these items comprises a real index to worth.

Proper improvements may have been sacrificed to build up the cash account; bookkeeping may be responsible for the dividends or, if not, the future ability of the company to earn money may have been neglected in order to pay present large dividends. Many a company has paid smaller dividends under an able, conservative, far-seeing management than under a reckless, improvident management that had an eye on the stock ticker.

An appraisal value means almost nothing except in the case of a company where the chief value is in the stock of raw material. As the manufacturing operations of a company become more refined, its buildings and machinery become more special. Their value as general machinery is not much more than their value as junk. Their value in the plant as a going concern, on the other hand, may be really much higher than the original purchase price. If we insist that the only safe values are forced sale values, then a modern plant would have to write off 75 per cent of the value of its buildings and equipment the instant they are installed.

The "statement of condition" real-

ly shows but little that is worth while knowing. It is merely an exhibition of the books at a certain time. It can show nothing more than the relation of the assets to the liabilities at the particular moment. That the assets are represented to exceed the liabilities means nothing at all.

A successful company is one in which the assets—the properties—are so managed as to earn money. Even in the least prosperous of manufacturing companies the assets will exceed the liabilities. But the most prosperous company cannot and really should not be able to liquidate out of hand. The assets of a corporation constitute its tools for work, and not primarily a fund that has been amassed against the possible claims of creditors. And a tool should be at work.

The "statement of operation" is the nearest exhibition of real worth—of the ability to function—that we have. A financier who is anything more than a respectable pawnbroker bases more of his conclusions of worth upon the operating record than upon any static statement. But even the operating costs do not tell the full story, for they do no tell, excepting in indirect fashion, the worth of the management.

The highest output at the lowest cost is gained only through continuity of work. The statement of operation does not show the continuity. Continuous employment is an absolute prerequisite for constantly lowering costs. In an economic sense all idleness during predetermined hours of work is waste. The "unemployment score" is the best all-around test of the effectiveness of management; the most searching and significant report to reach the manager's desk.

The time seems to have arrived when we must pull our discussion of unemployment down out of the skies of speculation and interpret it in terms of actual, every-day shop practice. Unemployment in the large is an insoluble problem. It is only as we break it up into its constituent parts that we are able to attack it. Nearly every representative manufacturing plant regularly collects the data required for the studies here recommended, but only a few plants here and there, and then in spasmodic fashion, have so collected the data as to reveal the relative significance of the various causes contributing to the total of unemployment.

Almost without exception our heretofore recognized standards of industrial management are in flux—in the crucible of change and refinement. It is equally true that all those criteria by which we seek to test the effectiveness of our industrial organization are in process of revision. Yesterday's satisfaction with methods and results is today's discontent. The ultimate object of everything we do in industrial engineering is to enable us to set tasks; that is, to establish a definite daily accomplishment for each and every worker. The daily check on the causes of failure to perform such predetermined tasks has come to be regarded as perhaps the most exacting test of good shop technique.

In late years we have come to recognize that the accomplishment of a predetermined task by an individual worker or by any number of individual workers is but a part of the whole problem of effective manufacturing. For if the individual workers are to have the opportunity to work at all, management must concern itself with many matters not directly related to the individual task. Everything we do in industry should lead in the direction of affording increasingly steady employment for the entire body of workers.

Assuming that the proper length of

the work day has been determined, employment for the individual or the group or the community as a whole is measured by the amount of time actually occupied in production work. The unemployment factor then is the percentage by which this falls short of the theoretical maximum.

It is becoming the union policy to have available work apportioned among the employes rather than to have some laid off or discharged in order that the rest may work full time. They do not consider lack of work sufficient cause for discharge. Within the last few months one concern employing over 2,000 was working the entire staff less than one day a week. Even with work at this low ebb, the effort on the part of the union to hold the employer to responsibility for employment was in no way relaxed.

In another plant, a normal staff of 19,000 had been reduced to 4,000, working part time. The unemployment has continued so long as to cause great destitution. But the workers still consider themselves as employes of the concern and there is no thought of looking for employment elsewhere. The total of "unemployment without the sheet anchor of a future job;" that is, the unemployment of what may be called jobless men, represents a relatively small percentage. In some industries and especially in good times, it may easily represent an almost negligible part of the total unemployment. Paradoxically, the serious unemployment is among those who have jobs, but are not working.

The moment the subject of unemployment is mentioned we are apt to drift off into a more or less loose discussion of the possible influence of exchange, the tariff, the disorganization due to a change from a seller's to a buyers' market, styles, and seasonal demand, through all of which we are supposed to be relieved of our individual responsibility. This is frequently little more than a smoke screen to cover up either our lack of knowledge or an avoidance of responsibility.

If what has already been done in this field has not proven that reasonably steady employment is possible of attainment for most industrial establishments, it at least points strongly in that direction.

But before anyone can study his own affairs he must have some form of record which will admit of comparison over periods and with other records. The formula should be so exact as to include layoffs of a few moments or of a few hours as well as of days and of weeks. It should be broad enough to be applicable to a given department of a single industrial establishment or to the plant as a whole, to regional divisions of an industry or to the industry throughout the nation, to geographical areas including all industries, and to the nation at large. But it must be simple or it will not be used.

I have arranged what I call the "Unemployment Score." It is the percentage by which the actual employment given an individual or group compares with the theoretically possible maximum. This is something different from labor turnover, which is defined as follows:

"Labor turnover for any period consists of the number of separations from service during the period. Separations include all quits, discharges, and lay-offs, for any reason whatsoever."

The percentage of labor turnover for any period is the ratio of the total number of separations during the period to the average number of employees on the rolls during that period. In the 10 or 15 years of its use, this term "labor turnover" has, of

course, achieved some degree of definition. But even so, it is a crude unit of measurement with not much significance in a well-run establishment. A study of the definition will show that its relation to the proposed "Unemployment within employment factor of unemployment" score is at best indirect. The usefulness of such a factor or score will be limited unless it is arrived at as the summary of factors measuring up in like manner. The process should be capable of being carried to any useful degree of subdivision.

Let me illustrate. Assume that the possible theoretical total of working hours for those engaged in a given department last week was 1,000 units of production time. Things ran unusually smoothly, material was delivered on schedule, there were no labor troubles, and the workers were actually engaged during 920 units of production time. The time lost is, of course, the difference between the theoretical and the actual, or 80 units of production time. Under our proposal, the unemployment score will be the percentage, or 8 per cent.

We can take the figures on that same department for all of last year and, assuming a result not so favorable, we can take 50,000 units as the theoretical maximum for the entire year. Say only 30,000 were actually accomplished. Then the unemployment score would be 40 per cent. Under the proposed plan it must be possible to subdivide this percentage indefinitely. Thus the major causes may be rated as follows:

Absenteeism	5%
Lack of materials	10%
Bad weather	4%
Strikes	10%
Scattering	11%
Total	40%

Any such approach to the study of unemployment involves some assumption which, while not current, seems to be fully in line with our probable industrial development. For instance, it appears to be altogether in the interest of a higher qualitative production that much more importance should be attached to the separation of the individual worker from a given industrial unit than is attached to his joining it. A mistake made in taking on a worker may always be rectified by a discharge before the end of the trial period engagement. But once the worker has been finally accepted and made a part of the organization, he should be held much more tenaciously than is our common practice. This is not because of any "ownership" in the job, but simply because if the worker has been carefully selected at the start, well trained in his duties, and properly fitted into the organization, his leaving is both a financial and a human concern.

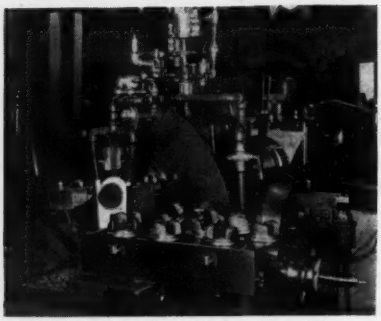
In the long run, however, we cannot hold people for whom we do not provide work. Therefore—and this is a matter that deserves careful consideration—it may be just as bad to take more work than our regular force can perform as to fail to secure enough work to keep the regular force busy.

It is the experience of the best managers the world over that, as better methods are developed, the employe becomes more skilled and hence more valuable. When management becomes truly scientific we shall have no room for "unskilled" workers. The better the management the greater will be the financial sacrifice in cases of layoffs and dismissals.

I believe we have now arrived at the time when the manufacturers who are to be the most prosperous in the long run will definitely decide on the size of force required and hold rather

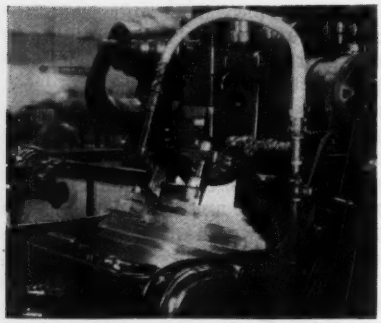
(*Continued on page 22*)

Greater Precision Lower Tool Costs....



Courtesy of Sundstrand Machine Tool Company Rockford, Ill.

OPERATION: TURNING AND FACING FLANGE YOKE.
MACHINE: SUNDSTRAND 12 IN. "STUB" LATHE.
MATERIAL: 1630 STEEL.
SPEEDS: 90 AND 137 R. P. M.
FEEDS: .019 INCH.
STOCK REMOVED: ¼ TO $\frac{9}{32}$ INCH.
PRODUCTION: 50 PIECES PER HOUR.
LUBRICANT: 1 PART SUNOCO TO 20 PARTS WATER.



Courtesy of Oesterlein Machine Company, Cincinnati, Ohio

NAME OF PART: CLAMP RING FOR AEROPLANE PROPELLERS.
OPERATION: MILL SLOT AND STRADDLE MILL FOR HINGE LUG.
MACHINE: 45 IN. OESTERLEIN OFFSET MILLER.
MATERIAL: S. A. E. 6135.
STOCK REMOVED: 2 CUBIC INCHES PER MINUTE.
FEED: 2½ INCHES PER MINUTE.
SPEED: 18 R. P. M. 12 INCH DIAMETER CUTTERS.
TIME PER PIECE: 30 SECONDS.
LUBRICANT: 1 PART SUNOCO TO 20 PARTS WATER.

Performance year after year in leading metal cutting plants has established the real value of Sunoco. Users who accurately check the cost of tool steel, the amount of time lost in re-sharpening tools and the number of rejects, are proving that Sunoco not only shows a decided saving in these items but that Sunoco also aids Machine Tools in producing better work where economy, speed of production and quality of finish are the requirements of efficient operation.

Profits depend upon production and production depends upon the full utilization of the productive capacity of modern machine tools. Accuracy and finish will give a "better product," but it requires modern equipment aided by an efficient cutting lubricant to produce accuracy and finish in a shorter time.

Sunoco reduces "time out" for frequent tool re-sharpening, it decreases rejections due to faulty finish and inaccurate tolerances, and the production of accurate work increases even though speeds and feeds remain the same.

Many users have increased production by higher speeds or deeper cuts, obtaining the same precision and quality of finish as at lower speeds.

SUN OIL COMPANY, Philadelphia, U.S.A.

SUNO

EMULSIFYING

Made by* SUN OIL CO. *producers

Akron, Albany, Allentown, Atlantic City, Baltimore, Battle Creek, Dayton, Detroit, Flint, Grand Rapids, Harrisburg, Jackson, (Mich.) burgh, Providence, Reading, Rochester, Scranton-Wilkes Barre, Syra-

...High Production ...Satisfied Operators

In high speed grinding—where wheels are worked hard, sometimes pushed to the very limit—the necessity for a free-flowing, non-gumming, quick heat-absorbing grinding fluid is of utmost importance. Sunoco prevents distortion and maintains accuracy; it further permits maximum grinding efficiency through the elimination of glazing. In addition, it will protect the finished part from rust and corrosion.

◆◆◆

Operators appreciate the cleanly qualities of Sunoco. It is hygienic and does not become rancid after prolonged use. Bacteriological tests prove that Sunoco does not develop pus-forming bacteria or pathogens which cause skin inflammation.

We cordially offer you the assistance of our widely experienced Cutting Oil Engineers. Write any of our many branches, or to our home office.

The Sun Oil Company produces a type of cutting oil to meet every metal-cutting requirement.

SUN OIL COMPANY, Ltd., Montreal, Canada.

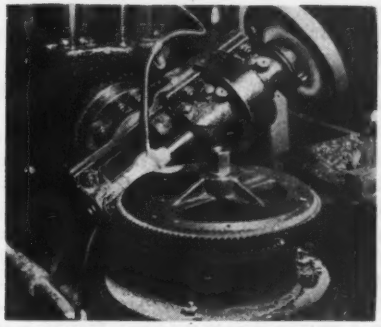
SUNOCO

CUTTING OIL

BLUE SUNOCO MOTOR FUEL

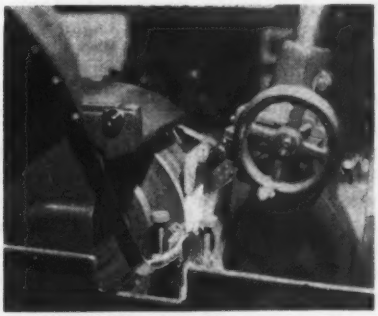
Philadelphia, Bridgeport, Buffalo, Cincinnati, Cleveland, Columbus, Dallas, Jacksonville, Miami, Montreal, Newark, New York, Philadelphia, Pittsburgh, Tampa, Toledo, Toronto, Trenton, Tulsa, Wilmington, Youngstown.

Courtesy of Bates-Wohlert Company, Lansing, Mich.



OPERATION: CHAMFERING STARTING GEAR TEETH.
MACHINE: FARWELL HOBBING MACHINE.
MATERIAL: 50 CARBON STEEL.
NUMBER OF TEETH: 110.
CUTTER SPEED: 150 R. P. M.
LUBRICANT: 1 PART SUNOCO TO 15 PARTS WATER.

Courtesy of Cincinnati Grinders, Incorporated, Cincinnati, Ohio



PART NAME: PISTON PIN.
MACHINE: NO 2 CINCINNATI CENTERLESS GRINDER.
MATERIAL: HARDENED STEEL.
LIMITS: ROUND WITHIN .00005 INCH, STRAIGHT WITHIN .00005 INCH, SIZE WITHIN .0001 INCH.
STOCK REMOVED: .001 INCH.
METHOD OF GRINDING: THRU-FEED.
PRODUCTION RATE: 28 PER MINUTE.
LUBRICANT: 1 PART SUNOCO TO 40 PARTS WATER.

Keeping Unemployment Score

(*Continued from page 19*)

tenaciously to it. In almost every case this will mean a force smaller than the one formerly employed. The better methods involved in this decision to give steady employment to the organization almost invariably means an ultimate reduction in the normal force. Every effort should be made to effect this reduction gradually through normal separations and not by discharges. While it may be hard doctrine, I am convinced that it is almost always a mistake to discharge for lack of work.

Another idea which, while not generally realized, nevertheless appears to be inherent in effective manufacturing, is that idleness on the part of piece workers has as decided an effect on cost as idleness anywhere else. The employer does not appear to pay for this type of idleness because he does not pay in direct wages. But he pays in unnecessarily high piece rates and in other, more direct ways.

Important as it is from a manufacturing standpoint to keep machines busy, it is much more important to keep the workers busy. Viewed from this angle, a check on man hours becomes altogether as important as a check on machine hours. Our tangible investment in machines logically makes machine idleness a high crime. As we come to realize the price that has to be paid for a plant morale under which goods can be manufactured at lowest cost, more effort will be put into guarding against workers' idleness.

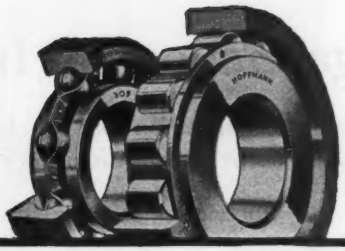
If these unemployment records are to have the largest significance and be fully effective as a guide to operating policies, lost time of every character and description must be included in the percentages. I recall on a visit some years ago to an establishment which had just introduced so-called "industrial democracy," that a large number of employes throughout the plant obviously had nothing to do. It developed that as a feature of the new order a promise of continuous employment had been made. The firm shortly thereafter experienced difficulty in getting an adequate supply of raw material, hence the people idle at their work-places. Continuous employment comes as the result of planning and good management. It cannot be had by the issuing of an order.

On the other hand, there are varieties of unemployment which result directly from a high type of management. For example, one concern has used the quota (for product) system quite successfully. When employes finish their tasks they are permitted to go home. Hence the attendance curve begins to drop shortly after 1 o'clock. In effect, unemployment begins. It may be considered a desirable variety, but it should be measured. Without knowing definitely its extent, even an astute manager cannot know whether its obvious advantages are otherwise offset.

To convey a more detailed idea of the situation which a fully developed unemployment record might uncover, let us assume that a group of workers have been employed 64 per cent of the theoretical time, leaving 36 per cent as the unemployment score. The unemployed time might be divided as shown in the previous chart.

Such unemployment records would have added significance if there were included in the plan some method of classifying and weighing the various contributing causes so as to show their importance from a management standpoint. For instance, unemployment occasioned by bad belting practice might be heavily penalized on

(*Continued on page 70*)



PRECISION

its meaning and its commercial value . . .

PRECISION, as commonly used, is a term defining extreme refinement of dimension and finish. But as describing an outstanding quality of *NORMA-HOFFMANN Precision Bearings*, the word has a far more comprehensive meaning.

To Norma-Hoffmann engineers and production men, *Precision* means the ultimate in dimensional refinement. Above and beyond this, however, it means bearing design worthy of expression in a finished product of this extreme refinement—selected materials well deserving of special treatments and of highly refined machining processes—standards of production which permit no deviation from absolute uniformity, regardless of quantity.

Precision, as thus described, is the foundation quality upon which the Norma-Hoffmann reputation rests, upon which its business has been built, and upon which it must continue to grow.

But what does all this mean to the buyer and user of *NORMA-HOFFMANN Precision Ball and Roller Bearings?* What, in other words, is the commercial value of *Precision?*

Briefly stated, *Precision* stands for that combination of qualities which manifests itself in higher anti-friction efficiency, longer life, greater speedability, better performance, lower costs for replacements, increased production. These are the distinct and concrete advantages which accrue to the user of *NORMA-HOFFMANN Precision Bearings.*

Obviously, *Precision* is costly to produce and to maintain. But it has been the uniform experience of those who have availed themselves of its advantages, that its price is repaid a hundred fold in the lower after-costs which inevitably follow.

The long, varied experience of Norma-Hoffmann engineers is offered without obligation to machine users and builders facing bearing problems.

"NORMA-HOFFMANN"

PRECISION BEARINGS

NORMA-HOFFMANN BEARINGS CORPN.—STAMFORD CONN. U.S.A.

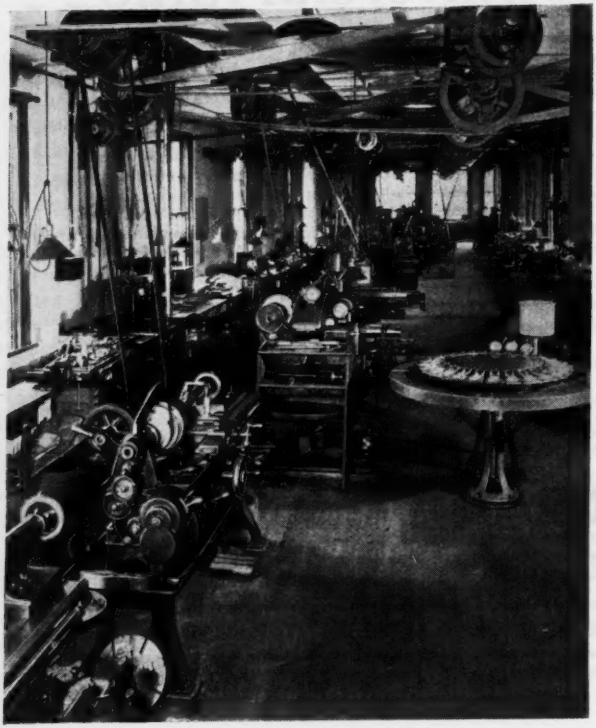
JIM K28 JIM K29

An Organization For Inventors

Here is an engineering organization and machine shop that is used as a basis for extraordinary service.

By JOSEPH PIGNONE

THE organization of Bernard & Heller, 31 East 17th Street, New York City, designers and builders of inventors' models and of special machinery, is an organization comprised of specialists, each one of whom is a practical combination of designer, development engineer and skilled mechanic. The ingenious co-ordination of the unusual ability and knowledge of this personnel, together with a vast equipment of precision tools and machinery, has resulted in an engineering service so comprehensive in scope and gratifying in merit, that this firm is nationally recognized as a pioneer and leader in its field.



Experimental Laboratory. Here is where the ideas are developed.

Since a considerable proportion of the work handled by Bernard & Heller is in connection with the development of inventions from crude ideas, or with the design and construction of machines to manufacture these inventions, it was logical and almost inevitable that complete patent attorney facilities should be added to the vast organization. Thus, under one roof and under one ownership and manage-

Office of Bernard & Heller Plant

ment, an unbroken train of service is offered to the customer. The practicability and utility of this plan is immediately apparent; and the response of this firm's customers to this additional feature has distinctly proved the need of mechanically-expert patent attorneys in the machine field.

An example of the smoothness with which this complicated but highly efficient organization operates—and an example which other fine development shops might follow—will be cited. A typical customer may enter the commodious offices, consult with Mr. D. M. Heller personally, and explain the idea which he hopes to develop and patent. He is then shown into the designing room, where an engineer and stenographer translate his idea into practical mechanical terms. From this point on, the procedure is likewise thorough and vital. It is possible, by the efforts of this single organization, that a patent application prepared by its mechanically-trained attorney may be applied for, a well designed working model constructed, a manufacturer will be contacted in the interests of the client, and finally the production machines to manufacture the invention will be designed and the plans held in readiness for the manufacturer.

Temporary tools, fixtures, jigs or dies might be furnished to start production under way, and as soon as sales orders warrant expansion, any special automatic machinery required

Drafting Room.

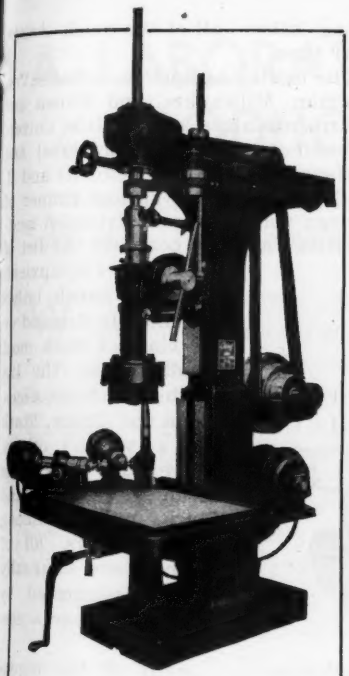
for production might be built. It frequently occurs, however, that after a patent has been obtained for a client and the invention has been developed and perfected to a finished state, either the inventor himself or a prospective purchaser of the invention is unable to gauge or prove the commercial salability of the invention as a product of market. In such a case, Bernard & Heller builds primitive tools and fixtures and manufactures a small quantity of the product in its plant. By this procedure, a tangible and material result is achieved which proves of tremendous value to all concerned.

Bernard & Heller Machine Shop.

As almost every job, while in the various stages of processing and completion, requires frequent inspections and comments by the customer, space is provided in the drafting room for his benefit. Here, surrounded by plans and specifications of his particular project, he may discuss improvements and alterations with the designers entrusted with the building of it, and he may also enter the experimental department adjoining and observe the progress of their efforts in his behalf.

The experimental department is another place where an unusually high caliber of artisan is required; the men must not only be expert as mechanics and be thoroughly acquainted with the most modern developments and trends, but they must be able to quickly grasp the exact thought back of the frequently inadequate descriptions given them by inventors, and be able from such descriptions to properly develop and perfect a project. Then, too, they must be able to co-operate intelligently with able engineers and technicians who are sent to the Bernard & Heller shops by the manufacturing concerns whose development work is being executed in this shop.

An important position in this organization is that of shop superintendent, the title in this case being hardly adequate. As the productive part of the organization is comprised entirely of master toolmakers, die makers, automatic machine specialists, electro-mechanical experts, instrument and watch makers, pattern makers and die casting experts, all of whom have been scrupulously selected for their skill and creative ability, the qualifications necessary for the intelligent and harmonious direction of this extraordinary assemblage may be realized. The superintendent is directly responsible for that fine co-ordination



The illustration shows an AVEY-matic Drilling Machine equipped with two drilling units arranged for operation in a horizontal plane and at an acute angle to each other.

Over 45,000 *Avey* Spindles

are Increasing production and cutting costs for more than 2,500 *Avey* Users!

AVEY equipment will help to increase your production and cut your costs too. Send us your problem and let us show you. Mail the coupon!

THE AVEY DRILLING MACHINE CO.

CINCINNATI, OHIO

Send complete details on AVEY Drilling Machines for the following work.....

.....

Name.....

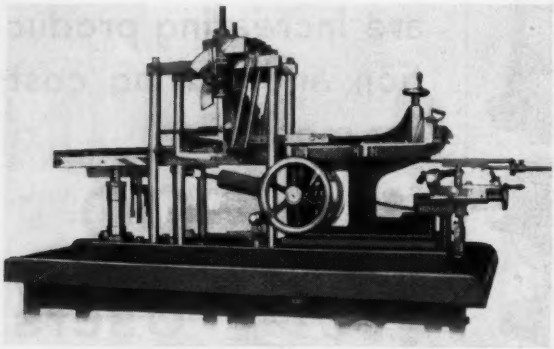
Firm.....

Address.....

City.....State.....

of intelligent individual thought and effort which is absolutely essential in an organization so perfectly planned and balanced.

A casual survey of the machine tool equipment and layout in the experimental and machine departments reveals the completeness one would expect in a large development and machine shop. A closer inspection, however, proves not only that the quality of the machine tools is above the average, but that the machines are subject to finer attention and more careful usage than is the rule in the average plant.



Machine for cutting the tone curves in clarinet mouth-pieces. The utmost precision is required, as the quality of the tone is affected by any inaccuracy in the curve.

The various departments of the machine shop are located directly adjacent to the planning, designing and drafting departments. Ample natural lighting is afforded by large windows in three of the four walls. The floor-space comprises approximately 10,000 square feet. The heavier machine units are grouped along the center, and the many precision bench tools are mounted on assembly benches along each wall. The larger machines include Seneca Falls lathes equipped with collets, Hendey lathes and large swing lathes—all of the quick change gear type.

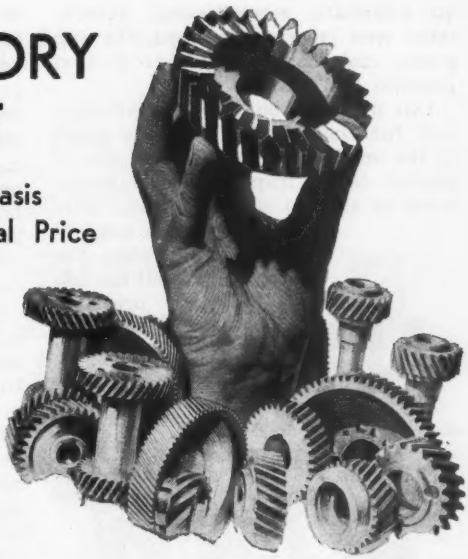
The milling equipment includes Van Norman, Milwaukee, and Brown and Sharpe machines, of the plain, universal and duplex types, universal and surface grinders of Cincinnati and B. & S. make, and a special shaper of foreign manufacture. Extended heat-treating facilities complete the list of heavier equipment. Precision bench lathes are most in demand on the class of work most handled here, the list of which includes Ames, Sloan and Chace, Stark and several others. There are also the Sloan & Chace and Stark millers among several others, all of which are unusually well supplemented by attachments and accessories.

Many of the ingenious mechanisms and contrivances encountered in every walk of everyday life, such as coin change makers, turnstiles, automatic vendors, postage stamp machines and the like, were developed in the experimental shop of this firm. Not only were such devices developed here but the first sample machines were built here, and also the special jigs and fixtures for quantity production.

Some of the more recent developments of this concern are extremely interesting. One of the most successful home furnace oil burners was developed in the Bernard & Heller shops. Another inventor submitted the specifications for an ingenious snap fastener, the marketability of which depended almost solely on the sinking of a particularly difficult die. Such a die was not only produced but

A LABORATORY PRODUCT

Made on a Production Basis Sold at a Fair Commercial Price



WERE it not for the development of special automatic machinery, Original Fellows Gear Shaper Cutters would cost you much more than you now pay for them.

It has taken years of research and experience to develop the special manufacturing and inspection equipment necessary to make this laboratory produce on a production basis.

Most progressive manufacturers have standardized on Original Fellows Gear Shaper Cutters for original equipment and replacement purposes. They have found that it pays. A saving of a few cents on Gear Shaper Cutters may cost you much more in trouble and spoiled work. For your own profit and protection standardize on Original Fellows Gear Shaper Cutters.

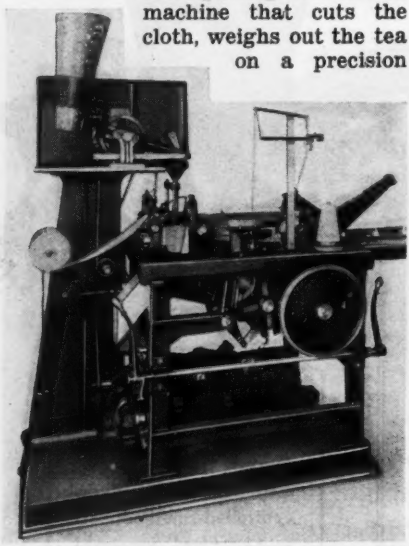
Control over tooth shape is absolutely essential in the production of quiet and efficient gearing. Fellows controlled methods assure the necessary accuracy at the lowest possible cost.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
(616 Fisher Building, Detroit, Michigan)

FELLOWS ~ GEAR SHAPERS ~

an automatic stock-feeding attachment was incorporated with the sub press, making maximum production possible and feasible.

One machine, built some years ago, still functions perfectly in the plant of the original purchaser; this gem of perfect design inspires the commendation of all who see it operate. It is a tea package or tea ball machine that cuts the cloth, weighs out the tea on a precision scale, forms and sews the bag and ties a knot around the bag—completing from 40 to 60 bags per minute.



Machine made by Bernard & Heller to manufacture the small tea-sack in which tea is apportioned. The machine cuts the cloth, weighs the tea, forms the bag, ties a double knot in the string, trims the ends of the bag, and ties the knot around the tag. Production, 40 to 60 complete bags per minute.

In contrast to some of the bewilderingly-intricate and ponderous automatic machine units, some of which weigh up to ten tons, Bernard & Heller has also produced some very fine precision work. Its staff has designed and built for its customers a new type of watch movement measuring 5/8 in. in diameter, an extra ribbon device to eliminate the use of carbon paper in a typewriter, and a foolproof index which automatically prevents the double exposure of camera film. Here also was produced a model of an alarm clock in which only one spring is required to actuate both the time and alarm movements, and which has but half the number of parts required in the average alarm clock.

In the development of new projects such as those mentioned, the designing engineers are first instructed as to the object and function of a proposed device or mechanism, and the sketches necessary to supplement a verbal discussion with the customer are made. Then preliminary drawings are carefully prepared, in which all the improvements and refinements that can be added on paper are incorporated. When the design appears to be as good as it can be made theoretically, the plans are turned over to the experimental department, where the practical work begins.

Irrespective of the type of project, the thought is always present that the device or mechanism may eventually be produced commercially in quantity and within certain limits as to retail selling price. Therefore a considerable proportion of all the effort expended on an invention is focused in this direction, and invariably the added cost of building a model along these lines is more than compensated for by the results finally obtained by the customer in marketing his invention. Some of the more recent inventors' and manufacturers' models that have been turned out here are designed to incorporate the use of such advanced developments as fabricated steel, built-in pyrometers, photo-electric cells, short-length radio waves, cadmium plating, and so on.

(*Continued on page 46*)

Fig. 23—Here are 7,800 balance screws—and the thimble holds all of them.

Building the Hamilton Watch, III

Making 0.014-in. 260-thd. screws—Sawing a 0.003-in. slot—Shaving the jewel settings

By HOWARD CAMPBELL

SCREWS are, as a rule, most uninteresting items of mechanical equipment, but the screws used in the manufacture of a wrist watch are interesting because of the extremely small size of both the screws and the tools with which they are made. In Fig. 23 is shown a thimbleful of balance screws of the type used in a Hamilton wrist watch. There are 7,800 screws in this pile—and the thimble holds all of them. The dimensions of the screws are given at **A** on the drawing Fig. 24. The length of the head **H** varies from 0.014 to 0.018 in. and the diameter **D** varies from 0.0212 to 0.0228 in., according to the type of watch in which the screws are to be used.

In the cross section drawing of a Hamilton wrist watch, Fig. 2, Page 8, January, 1932, issue of MODERN MACHINE SHOP, a balance screw was indicated as Detail 52. In the same drawing, between the parts numbered as 44 and 45, can be seen a screw that is not numbered. This screw is the balance upper endstone cap screw, the dimensions of which are given at **B** in Fig. 24. The thimble illustrated above will hold 13,000 of these screws.

The balance screws are made of either brass or gold, depending upon the weight desired, and are turned, threaded, and cut off in screw machines that are especially designed for the task. A view of a battery of these machines is shown in Fig. 25. Each machine will turn out approximately 10,000 gold screws or 6,000 steel screws per day.

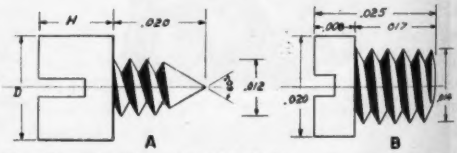


Fig. 24—Drawings of (A) Balance Screw and (B) Upper Endstone Cap Screw.

Probably the most interesting part of the job is the manner in which the threads—260 to the inch—are cut on stock that is 0.014 in. in diameter. A spring-die is used, made of a piece of round tool steel that is turned to a diameter of approximately 0.160 in. and tapered on one end to fit the holder in which it is to be used. A ¼-in.

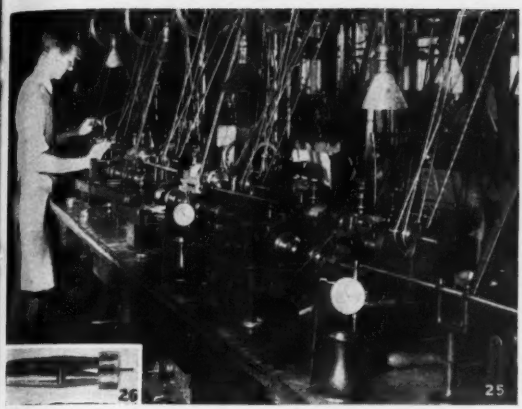


Fig. 25—Battery of automatic screw machines, each of which can make 10,000 gold screws per day. Fig. 26—Spring-die (actual size) with which 260-P threads are cut.

clearance hole is drilled through from one end to within ⅛ in. of the other, and a 0.010-in. hole is drilled through the closed end. This hole is then tapped out with a 260-thd. tap, after which the clearance is milled out to leave four rows of teeth. The die is now tempered and hardened, and then a steel ring, tapered internally, is slipped over the end of the die and the four sections are closed in to obtain the desired size. One of the dies, from which is projecting a piece of 0.014-in. stock on which a 260-P. thread has been cut, is shown in Fig. 26.

The hairspring in a watch is coiled about the balance staff, the outer end of the spring being held by the regulator pins (indicated as Detail 48 on the drawing Fig. 2 referred to above) and the inner end being staked in a collet that is pressed onto the balance staff. A drawing of the collet is reproduced as Fig. 27.

The collet is turned and cut off in an automatic screw machine, a 0.014-in. hole being drilled through the center in the same operation. It then comes to the machine shown in Fig. 28, where it is pressed onto a stub arbor, thus enlarging the hole to 0.0015 in. on one end and 0.00164 on the other. The arbor is held in the spindle of the machine. The operator then feeds the turret forward and turns the periphery of the piece, using a box tool. In the next movement the collet is faced, countersunk, and chamfered with turret tools in which the cutting tools are sapphires.

The spindle is now stopped while an arm at the left front of the machine is raised and a saw is used to saw a slot 0.003 in. wide in one side of the collet. The saw is held on a spindle that runs in bearings located in the arm, the spindle being driven by chain from a sprocket in the opposite end of the arm, which

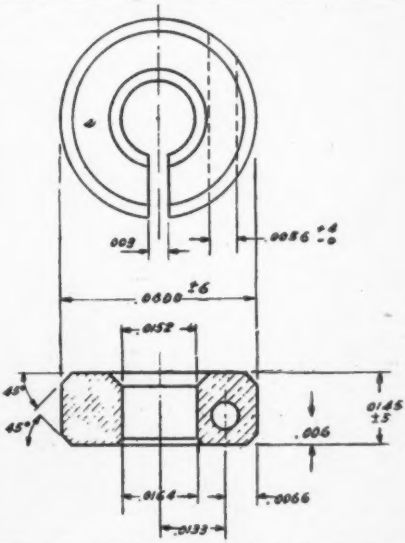


Fig. 27—Drawing of hairspring collet in Hamilton watch.

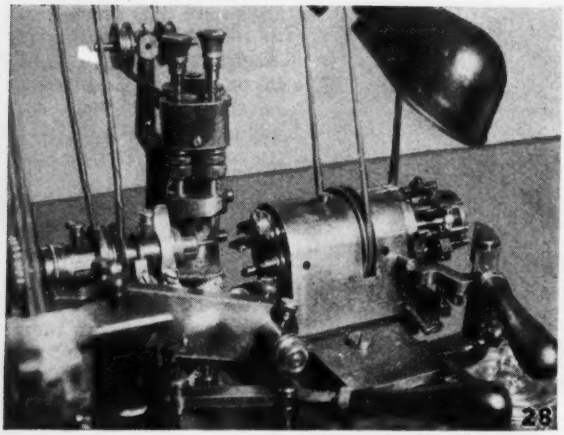
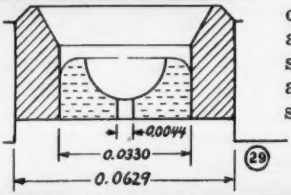


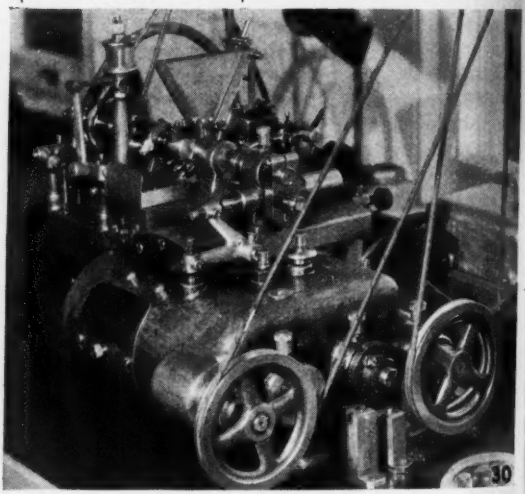
Fig. 28—The collet is turned, faced, countersunk, sawed, and drilled in this machine. Fig. 29—Cross-section drawing of jewel and setting assembly. Fig. 30—This machine faces and bevels the jewel settings.



in turn is driven from the overhead countershaft. The arm is pivoted so that the saw can be raised.

In the next movement a centering tool, held in a minute chuck on the end of a spindle that is poised over the collet, is pressed downward, drilling a center hole in which a drill can be started to drill the cross-hole. It is necessary that a sturdy tool be used to make an opening for the drill, as the hole is to be drilled off center, as shown in the drawing, and the point of the drill would be likely to "run down hill." After centering, a movement of a lever at the front of the machine swings the center drill spindle out of the way and positions the spindle carrying the drill. The drill is 0.0056 in. in diameter. Thus the piece is turned, faced, countersunk, sawed and drilled in this operation, a production of 1,200 pieces in 15 hours being obtained.

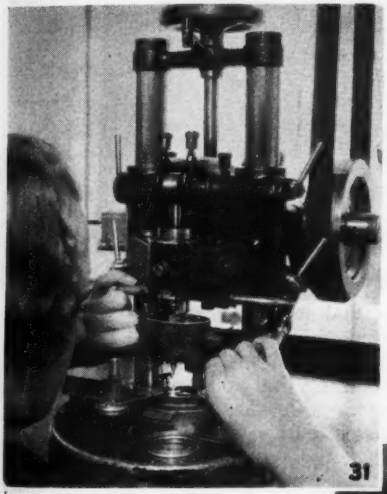
Each jewel in a Hamilton watch is held in a setting that is drilled and cut from the end of a brass or gold rod, this operation being performed in a small automatic screw machine. In the next operation the jewels are pressed into the settings, where they are held by friction as shown in the drawing Fig. 29. The jewel is 0.004 in. larger than the hole in the setting, making a press fit. In a later operation the settings, carrying the jewels, are placed in the hopper of the machine



shown in Fig. 30, where they are fed automatically, one at a time, into a chuck where they are revolved while diamond tools face them to the correct thickness and machine the inner and outer bevels. The entire operation is automatic, and the finish imparted by the diamond tools is so smooth that the settings appear to be polished.

Figure 31 shows the operation of shaving the outside of the setting to finish diameter and to perfect concentricity with the hole in the jewel. The diameter of the settings shown is 1.60 mm. (approximately $\frac{1}{16}$ inch).

In order to locate the piece by the hole in the jewel for the shaving operation, the jewel is slipped over a pilot that projects upward through a pressure pad in the center of the die, as shown in Fig. 32. The hole in the jewel is 0.0044 in. diameter and the diameter of the pilot is 0.0042 in., providing a push fit. When the punch descends, it forces the work, pilot, and pressure pad downward through the die, removing a shaving that is probably 0.004 in. thick. The diameter of the setting is held within 0.0001 in. of the specified size, and the periphery must be concentric with the



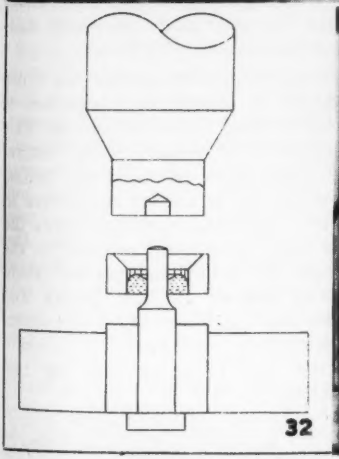


Fig. 31—Shaving the jewel setting to size. Fig. 32 — Drawing showing how jewel and setting assembly is located so that the setting will be shaved concentric with the bearing hole in the jewel. Fig. 33—Each jewel and setting is inspected through this microscope. No flaws get by this operator.

Fig. 34—Gaging the pivots on the ends of wheel-shafts. Fig. 35—Assembling the jewels to the plates and bridges.

hole in the jewel within the same limit.

Before the jewel and setting assemblies are passed on to the operator who assembles them to the plates and bridges, each jewel and setting is inspected under the powerful microscope shown in use in Fig. 33. The jewel is picked up with a fine-pointed tweezer and held in the glare from two lamps, one above and at the rear at an angle which will reflect the light through the jewel, and the other below, enclosed in a box with a glass top through which the light can shine. Any crack or defect in either the jewel or its setting, no matter how minute, can easily be detected in this manner.

The next task is to fit each wheel journal to its own individual bearing; in other words, a jewel must be selected which will be an exact fit for the pivot on one end of one of the wheel-shafts. To do this, one operator gages the holes in the jewels with fine plug gages and thus selects and segregates the jewels by the sizes of the bearing holes, while another operator gages the diameters of the pivots and selects the jewels that fit them.

The pivots are gaged with the instrument shown in Fig. 34, which is a dial indicator that is so arranged that it can be operated by the thumb. The wheel is held with one pivot against the upper one of a pair of jaws and the lower jaw is closed against it, as shown, the hand on the dial indicating the diameter of the pivot. The dial is graduated to 0.0004 in., and the operator can easily estimate to within 0.0002 inch.

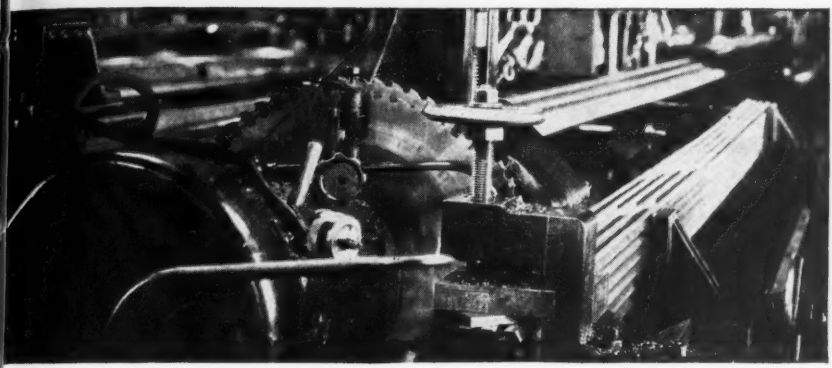
The last operation before the train of wheels is assembled together is that of setting the jewels in their places in the pillar plate, barrel bridge, and other parts of the frame. This operation is shown in process in Fig. 35. Here the operator takes the jewels that have been selected in the previous operation and presses them into the places in the plates and bridges that correspond to the pivots for which they were selected. A small, sensitive foot press is used for this operation.

(The fourth and concluding article of this series will be published in the April issue.)

March, 1932

Metal Cutting Methods

By Simonds Saw and Steel Co.



Maintaining Feed and Speed On Hard Metal Cutting Jobs

FOR maximum production the feeds and speeds vary almost as much as the material being cut, the size of the section being cut, the density or hardness of the stock. The principal reason for this is frictional heat. The feed and speed must be adjusted so that the extreme cutting edge (.001 or .002 back) is not allowed to become heated to a degree where it softens the tooth at the point very much below the original heat treated hardness. If this occurs the tooth will dull rapidly without having accomplished much cutting production.

On very hard material which throws blue chips when cutting a very slow rim speed of the saw is best. As low as 25-foot rim speed is often desirable. This reduces the friction to a minimum, on the same principle that as drilling a very hard piece of stock such as a hardened and tempered saw blade if an attempt is made to drill at the ordinary speed the drill will dull at once without even marking the material, whereas if some of the lead is taken out of the drill and it is run very slowly a hole may be made in exceptionally hard stock.

Keep in mind that it is not necessary or desirable to reduce the FEED in proportion to the reduction made in the rim speed of the saw. As a matter of fact a feed gauged by the strength of the saw and the machine on which it is operated will give greater production before dulling the saw than if a light feed is maintained. This is explained by the fact that the number of contacts of the teeth are the same, each revolution of the saw, with slow feed as with the maximum heavy feed. The dulling effect is very nearly the same with the disadvantage of advancing more slowly through the cut, with a corresponding loss of production.

(Continued on Page 2)

(Continued from Page 1)

Using the Simonds "Red Streak" Inserted Point Metal Saw — as shown on page 1 — you have a saw with teeth inserted in such manner that they cannot work up or down after the wedge is inserted and are held as rigidly individually as a lathe or planer tool in the tool post, and, if kept as sharp, will stand as much thrust as the lathe tool.

Too much cannot be said in favor of keeping the teeth sharp and the saw in round so that each tooth does its full share of the work.

Having in mind these three principal controlling factors of a good running saw — Rim Speed, Feed, and Abrasive Heat — the operator can, by a study of each, get the correct action on any kind of material he may be cutting and get the correct conditions for maximum production. As the hardness and density of the material decreases, faster rim speed and feed can be maintained.

Take the other extreme, soft brass, silver, etc. Soft brass is being cut successfully, 8" rounds, at a rim speed of about 600 feet per minute and feed at the rate of 1" per second, with a Simonds "Red Streak" Inserted Point Saw. Specially made "Red Streak" Saws are made to 5,000 to 7,000 rim feet for cutting brass pipe.

We make Slitting and Slotting Saws suitable for every purpose from 5/8" to 8" also High Speed, Semi-High Speed, and Carbon Metal Milling Saws from 9" to 36", also the same size Semi-Friction Saws for cutting thin metals specially treated to be run at 5,000 to 14,000 rim feet per minute, cutting at fast feed, Carbon and High Speed Hack Saws, Metal Cutting Band Saws, Tungsten Carbide for cutting special materials. In fact we furnish a saw for every metal cutting problem. Let us know what you are cutting, with full information, and we will help you to get the right saw for the work, the right feeds and speeds. Write to Simonds Metal Saw Department, Fitchburg, Mass.

Number of Teeth Important in Metal Band Sawing

IN metal cutting with the modern hard edge band saw blade it is important that the proper number of teeth be used for different kinds of material.

The following illustrations will bring out clearly the facts we wish to suggest:

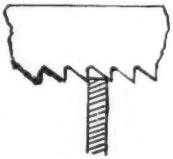


Figure one illustrates a coarse tooth saw being used on very thin material. One tooth is out of the cut before the next tooth enters and as a result the work vibrates and damages the teeth of the saw. This is especially true when using a gravity feed machine with nothing to retard the feed except the point of the tooth bearing on the material being cut.

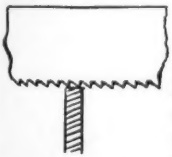


Figure two shows a fine tooth saw used on thin material. Note that at least two teeth are always engaged in cutting. This eliminates any possibility of the teeth "straddling" the work and shelling.

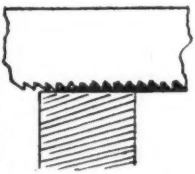


Figure three shows a condition which does not produce good results, owing to the fact that the fine teeth easily become clogged with chips.

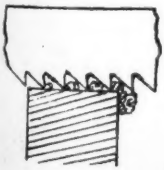


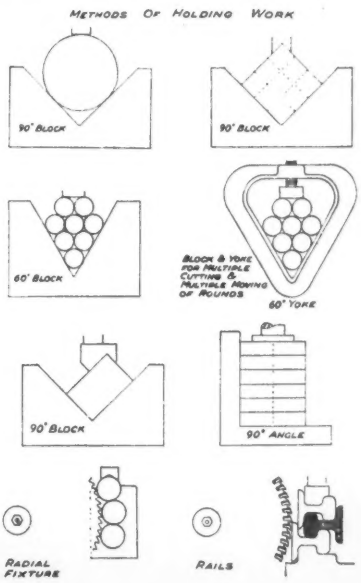
Figure four illustrates the proper saw to use on this same material. The coarse tooth gives proper chip clearance and makes a real cutting tool.

A 14 tooth saw running at 120 lineal feet a minute is best adapted for general work. On production work where the same size and kind of material is being cut day-in and day-out, there is one speed and tooth that will give the maximum results. If we were furnished a few samples of the material being cut, together with information as to size and make of the band saw machine, length, width and number of teeth of the saw now being used, and the speed at which the saw is running, we would be pleased to go into any band saw cutting problem and suggest a saw of the specifications which should give the best results. Write Metal Saw Department, Simonds Saw and Steel Co., Fitchburg, Mass.

Gang Metal Cutting Is Most Economical

HERE is a cost saving method of cutting bars, rails or difficult shaped material with an Inserted Tooth Metal saw. Just gauge them together in a yoke or special block.

The following diagram suggests the method:



We Hear

Moses appears to have withstood the "bullrushes" in the Senate. He's from the Granite State and a tough fella to tip over. This proves what we have said before, that action counts in metal cutting as well as in politics. You'll get a lot of action and long service from a Simonds Inserted Tooth Saw.

* * * *

March "comes in like a lion and goes out like a lamb." Usually by July 1st in these parts. Lasting weather. Which reminds us that High Speed Steel Hack Saws — the Red Streak kind outlast and outcut substitutes from 10 to 20 times.

* * * *

Don't judge a man by the outside of his clothes. You ought to look at the lining and the seams and the buttonholes. This applies to hack saws. Study them a little. If you see the Red End on a blade that's your tip. The quality is there.

* * * *

Will Rogers of Oklahoma says: "All I know is what I read in the papers." Next time you have a chance, Will, look over Modern Machine Shop. Lad — there's a paper for you — good readin' and every month little hints on how to use metal saws, hack saws and files. Aint that the truth?

* * * *

Girl in Kalamazoo wants to know if all the Indians come from Indiana and if cowboys still ride herd on the crooked trails of Boston. You tell her. We're too tender hearted.

* * * *

Another one (not in Michigan) thinks a Simonds Red Streak Metal Saw is musical because when she was a girl a stage troup visited her town once and they played tunes on some circular saws that caused her to weep. Have courage— some saws have been known to make strong men shed tears of grief.

* * * *

Answer to anxious youth — No it is not true that married men live longer than single men — it only seems longer.

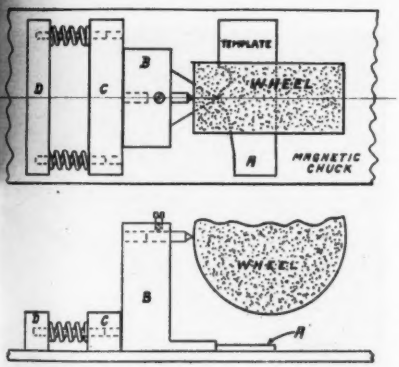
Ideas From Readers

This department is a clearing house for ideas. If there is a "kink" or short cut in use in your shop, send in a description of it. We will pay $5 for each one published.

Dressing a Wheel for Form-Grinding

By CHARLES KUGLER

WITHIN certain limits, a grinding wheel can easily and quickly be dressed to the desired shape for form-grinding by the method described here. Using a piece of heavy sheet metal, a template **A** is made and finished on one edge to the reverse of the shape desired on the work. A block **B** is made of brass, the upper part of the block being drilled for the diamond holder and the screw by which it is clamped in position, and the lower part of the block being cut to a sharp angular point, as shown, to serve as the stylus or guide for the diamond. The section **C** is also of brass and the section **D** is of steel so that it will adhere firmly to a magnetic chuck while the brass block will be free to move.



Drawing showing method of dressing a grinding wheel to form.

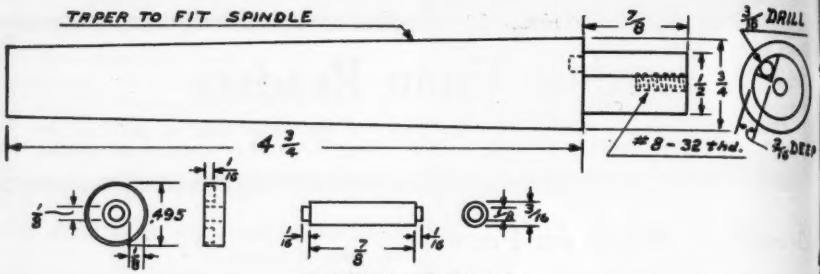
With the template **A** and the steel block **D** held firmly in position by the magnetic chuck, the block **B**, carrying the diamond, is moved back and forth across the face of the wheel, the diamond following the outline of the template and duplicating the design on the face of the grinding wheel. This apparatus is simple and inexpensive to make, and is a positive method of obtaining the contour on the face of a grinding wheel. The depth desired is obtained by moving the table of the grinding machine.

Quick-Action Lathe Arbor

By CHARLES R. WHITEHOUSE

THE drawing shows the design of a lathe arbor that is in use on a high production job. The arbor is made to a size and taper that will fit the spindle of the lathe, with a straight section on the end, ⅞ in. long and ½ in. diameter—which is a sliding fit in the hole in the work. A slot is machined in the end section, tapering from 0 at one edge to $\frac{3}{16}$ in. at the other, as shown. A $\frac{3}{16}$ in. hole is drilled endwise into the body of the arbor, at the end of the slot, and a hole is drilled and tapped for a No. 8-32 thd. machine screw in the end of the arbor.

Added to this is a pin, $\frac{3}{16}$ in. in diameter and with each end turned to ⅛ in. diameter by $\frac{1}{16}$ in. long, and a collar, approximately 0.495 in. in diameter and ⅛ in. thick. A ⅛-in.



Quick-Action Lathe Arbor.

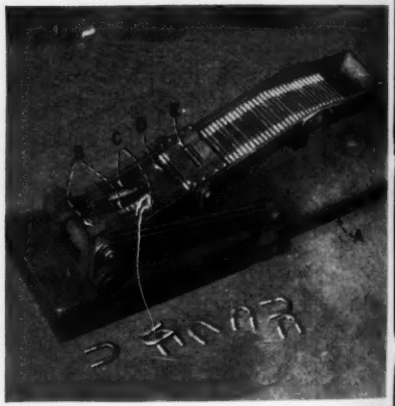
hole is drilled through the center of the collar for the machine screw, and a groove is cut in one side to a width of ⅛ in. and a depth of $\frac{1}{16}$ in. The pin is placed in the slot in the arbor and the collar is applied so that one end of the pin is in the $\frac{3}{16}$-in. hole in the arbor and the other end is in the slot in the collar. Thus the pin can slide on the inclined surface of the slot, but cannot fall out. With the collar fastened tightly with a screw, the arbor is ready for use.

As the roller is of the same diameter as the depth of the slot at its deepest point, the surface of the roller is even with the surface of the ½-in. section, thus allowing a piece of work to be slipped over the end of the arbor without difficulty. When the lathe is started, however, the roller will be thrown back and wedged between the work and the bottom of the slot, thus preventing the work from slipping. Pressure of the tool in the cut only serves to wedge the roller more tightly in place. A similar tool is now in use on a job where the diameter of the work is held within a limit of 0.002 in. and the arbor holds tightly enough so that a feed of 0.013 in. can be used.

Die for Bending U-Bolts

By A. E. GRANVILLE

IN a shop where a large number of U-bolts are used, the simple press fixture shown in the illustration is used to bend the bolts. The bolts are made of 5/16-in. rod, cut to 5 in. lengths in a shearing die and then threaded on each end in a bolt threading machine. As the bars that are to be held by these bolts are square, the bending punch is made with a three-cornered end. A close examination of the finished bolts in the foreground



A U-Bolt Bending Fixture

will show three small indentations where the corners of the punch have left their impression.

When the fixture is placed in the press, the lever **A** will drop farther than is shown in the illustration, thus allowing the throw-out **B** to rest lower in the recess between the side-rolls **C** of the die. Seven bolts are bent at one stroke of the ram. After a bunch of bolts has been bent, the lever

A is thrown forward and the bent bolts are ejected into a chute. Pulling back on the lever draws down the tongue **D** and at the same time pushes up a similar tongue through the slot **E**, thus allowing seven bolts to roll down into place on the die-rolls.

When the lever is again thrown forward to eject the bent pieces, the tongue **D** comes up and the tongue at **E** is drawn down, allowing seven bolts to roll down against the stop **D** ready to be released onto the die. The release is accomplished by a further movement of the lever. The manipulation of the tongues is accomplished by means of a small lever that is not shown, attached to the yoke shown between **D** and **E**, and to the operating lever.

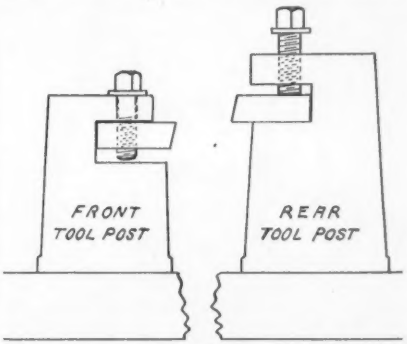
Screw Machine Forming Tools for Small Lot Jobs

By D. A. ROGERS
Dayton-Rogers Manufacturing Co.

IN the machining of screws, studs, and similar work where shoulder dimensions or other profiles have to be held fairly close, and where the number of parts to be processed does not warrant the use of a circular forming tool, the writer has obtained good results by using the tools shown in the illustrations. These tools consist of a pair of mild steel tool posts—front and rear—fitted to a hand screw machine, and flat forming tools.

To machine a screw such as that shown, a flat tool is made up of a piece of high speed steel, machined to shape and drilled and tapped to fit two screws in the tool post. All tools for this post are drilled standard so that they can be applied without delay. The tools for the front post are drawn tight by the screws; the rear tools are held in position by tightening the screws down against the tools. The rear tool is, of course, placed in the tool post with the cutting edge down.

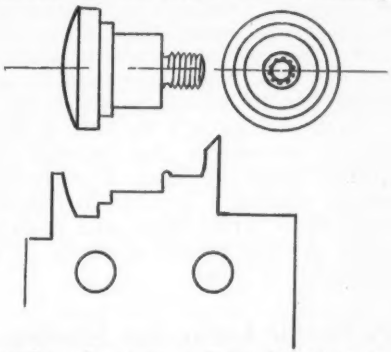
The cutter shown is a combination forming and cutting-off tool. This design is not recommended for all types of jobs, however, as the cut-off section



Flat formed tools held in front and rear tool posts.

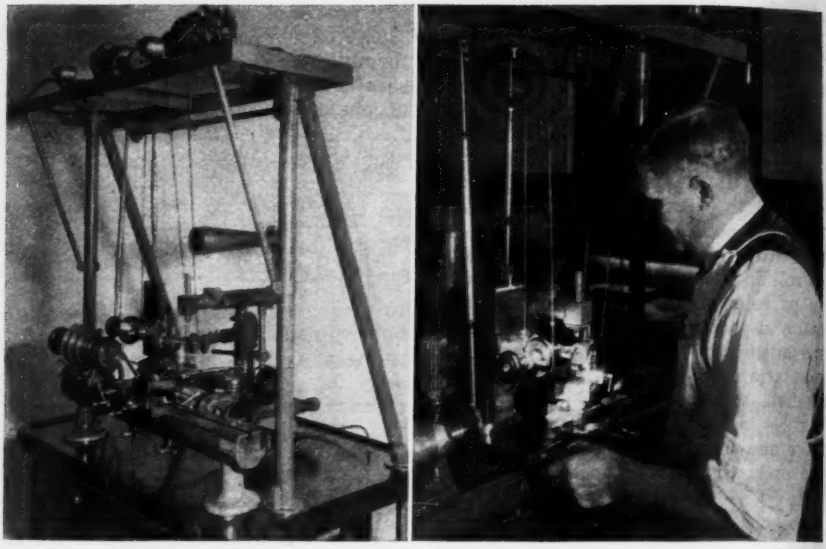
requires grinding frequently. When machining steel parts, the cut-off tool may be independent of the forming tool, so that it can be removed and reground or replaced without disturbing the forming tool.

By taking advantage of the graduations on the collar of the milling



Drawing of a screw and the formed cutter with which it was made.

machine, a form tool can be quickly ground to close dimensions, the extreme accuracy being obtained in the grinding or by hand filing. It is a



(Left)—Profile lathe, consisting of a standard bench lathe extensively redesigned and augmented to meet the peculiar demands of miniature work. (Right)—Using the profile lathe to form miniature parts in the Bell Laboratories' Development Shop.

common tendency for toolmakers to put too much clearance on tools of this type, and it is difficult to keep the clearance constant and accurate. A constant clearance is, of course, necessary to insure long life to the tool. The clearance angle is usually not less than 7 nor more than 12 degrees, and 10 degrees is customary.

An advantage of a flat tool of this design consists in that it may be ground easily by using a magnetic chuck, making it possible to remove the cutters, grind them, and replace them in their former positions in a minimum of time.

A Profile Lathe for Machining Miniature Parts

By EARLE W. GAGE

THE Development Shop of the Bell Telephone Laboratories, under the direction of G. F. Atwood, consultant, recently designed and built—from a standard bench lathe—a unique profile lathe for the machining of miniature work. The degree of mechanical precision which is adequate in most shops does not meet the need in the delicate field of communication. Elsewhere exactness is required principally to insure perfection in mechanical fitting and for the interchangeability of parts, and need not exceed what may be secured by the usual methods of measuring. Communication apparatus, on the other hand, is used to produce effects that are judged by the subtle senses of hearing and sight, and defects of equipment which are mechanically imperceptible may seem disastrously large to the ear or eye.

To meet the needs of such critical dimension, a special lathe was needed to shape the innumerable miniature parts for the experimental models. Often these parts of irregular profile, in which every length, angle,

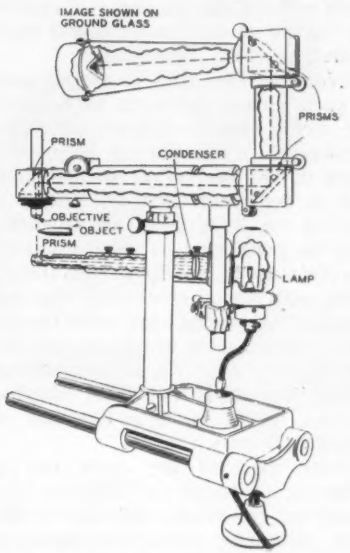
and radius of curvature must be correct to 0.001 inch.

Unlike the ordinary lathe, the profile lathe carries no tailstock, since the materials that are to be machined are so short that they can be firmly chucked in the headstock alone. Instead, it has two additional headstocks whose spindles can be independently and simultaneously driven by motors of variable speed. The main headstock is only occasionally used as such; ordinarily it is used only to produce a reciprocating motion to drive certain of the various sliding carriages supporting the other two headstocks. Both of these are suited for chucking either the work or tools; the carriages can be moved in all directions, either by hand or by drives from the main headstock.

A motor in the rear of the bench drives a slow-speed jackshaft which furnishes power through sprockets and chain to the main headstock. From this head, by means of a crankpin, connecting rod, a rocking shaft, and a second connecting rod, a reciprocating motion is imparted to the vertical slide on which the second headstock is mounted. The spindle of this head is driven through an elastic belt by a motor mounted on the superstructure.

The second head may be set at various angular positions about the horizontal axis of its mounting to the vertical slide, and about the vertical axis of this slide mounting to the compound slide on the lathe bed. By screw feeds in the compound slide, the head can be moved in the plane of the bed. When continuous rotation of the work or tool is not required, the headstock can be replaced by a vise or an indexing milling fixture.

The third headstock, the spindle of which is driven by a belt from a second motor on the superstructure, is mounted on a screw-adjusting slide which, in turn, is pivoted about a vertical axis to a compound slide clamped in the lathe bed. This head can be given a continuous oscillating movement about the vertical axis by a drive from the jackshaft through a belt, a worm and wheel, a crank with adjustable crankpin, and a connecting rod.



Design of periscope projector, which provides a means of measuring the work accurately without the necessity of removing it from the lathe headstock.

By the use of the upper slide, the radius of rotation of the head about the axis can be adjusted, and by the compound slide the head can be fed across or along the lathe bed. A stationary tool holder can be substituted for the third head, as for the second.

Machining operations of all types may be performed in this lathe. The variable speed of the motors enables free use of tools for turning, milling, sawing, drilling, grinding, lapping, and polishing. When brittle materials such as sapphire, diamond, quartz, or

glass are being machined, a special adaptor is interposed between the third headstock and its slide to limit the pressure of the cut by providing a cushion between the work and tools. The ability to machine complicated work without the necessity of removal for taking measurements, and so on, is an important advantage.

Every surface and clearance angle of such minute products as a recording stylus may be formed with great accuracy. By chucking a piece of work in the second headstock and a tool in the third, and oscillating the tool on its pivot, a spherical surface may be generated by radius equal to the distance of the tool from the pivoting axis. Then, combining the oscillation of the third head with the vertical reciprocation of the second head, the surface may be lapped and polished. Spherical points of playback needles, 0.0001 in. in radius, are machined this way.

Since most of the work for this lathe is too small to measure accurately by the usual methods without first removing from the head, the measurements are made on the spot by means of a periscope projector; an instrument which, when moved over the work, projects a magnified image of the work on a ground glass screen on which is also marked an enlarged drawing of the work-piece. Magnification and scale of drawing are usually 50 to 1. Highly corrected lenses and prisms are used in the projector, insuring exact matching of the work with the drawing.

Organization for Inventors

(Continued from page 30)

The service that has been made available to industry by Bernard & Heller is, in many instances, invaluable. The jobs that are brought to this plant from all parts of this country, Canada, and Europe range in cost from $50 to $25,000 and over. Many of them come from large manufacturers, who make use of this plant with its organization of engineers, master craftsmen and patent experts as an experimental department for their own plants. Even when the high salaries paid to some of the members of this concern are taken into consideration, the results obtained make this service, in many cases, a distinct economy.

In conclusion, the writer is impelled to speak of the unusual caliber of executive, organizing and technical ability required to lead this well known firm. The job is capably handled by Mr. D. M. Heller himself, who is a consulting engineer (member A. S. M. E.), and who personally follows every job through his plant from the drawing board to the paint spray or finished product.

General Electric Awards For Suggestions

A KEENER interest in learning to do their job a better way netted employes of the General Electric Company a total of $55,739 during 1931. The annual suggestion report of the company, just issued, reveals that 19,595 suggestions were made by employes during the past year, or an average of 428 suggestions for every thousand employes.

Of the total number of suggestions submitted during the year, 6,383 had sufficient merit to be adopted by the company, or an average of 139 for every thousand employes. During the year, 32.6 per cent of the recommendations were acted upon favorably, as compared to 32.1 per cent in 1930.

The highest amount paid for a suggestion during the year was $1,000, which was awarded to an Erie, Pa., employe. The average award per adopted suggestion was $8.75. The high award for 1930 was also $1,000, paid at the Schenectady works.

Employes of the ten plants in Schenectady, West Lynn (two), Pittsfield, Erie, Fort Wayne, Bloomfield, Bridgeport, Philadelphia, and Oakland are included in the plan.

"Won't cost any more?

...by all means get the Shepard"

A COUPLE of years ago, many concerns ordered their electric hoists from Shepard without even asking for a price. They wanted quality, and didn't worry about cost. Today they watch the dollars, but still send their orders to Shepard. For they find that they pay no price premium for the better performance of a Shepard.

Quantity production methods enable Shepard to put precision work and the finest of materials in Shepard Hoists, without increasing their final costs.

Shepard can apply quantity production to a degree unapproached by any other hoist builder. Because, Shepard Electric Hoists are made on a unit construction basis.

SHEPARD
CRANE & HOIST DIVISION

And, Shepard sells nearly as many hoists as all of the other manufacturers combined, and has been doing so for years.

At your request our representative will call with proof that you pay no more for a Shepard. If you prefer, we will send an informative booklet.

SHEPARD NILES
CRANE & HOIST CORPORATION
Main Office: 424 Schuyler Ave., Montour Falls, N.Y.
Works: Montour Falls and Philadelphia, Pa.

Only a Shepard has these features:

1. *Balanced Drive, at two opposite points.*
2. *Perfect alignment, all moving parts rotating around a common axis.*
3. *Lubrication, by Automatic Oil Bath.*
4. *Controlled by rope, push button or outrig for every hoist.*
5. *Precision variable speed control for both A. C. and D. C.*
6. *Variety of speeds, types, lifts and capacity precisely suited to any specific service.*

Over the Editor's Desk

THIS issue of MODERN MACHINE SHOP is fairly representative of the field covered by this publication; in the feature article the reader is taken on a trip through a large and progressive locomotive shop, and later on he is shown how microscopic threads are cut on parts for a small wrist watch.

It is true that each class of work is highly specialized, yet the principles of working the metal are the same. The foreman who supervises the cutting of threads on frame bolts for a locomotive will probably never have to cut or oversee the cutting of a 260-pitch thread on a screw, but he is a better executive for knowing how it is done. And the watch factory superintendent will probably never find himself directing the machining of work that can be moved only with the aid of an electric crane, yet an understanding of the problems involved in the machining of such work cannot but give him a better appreciation of his own problems.

To the hundreds of men whose work is of similar character, each of these articles is practically the equivalent of a trip through the plant under discussion, and in any case the reader has absorbed information that will broaden his viewpoint and give him an added interest in the work he is doing.

ANENT the subject of "hoarding" —which seems to be the most important topic of the day—we were much interested in an article we found in the February issue of "The Dragon," which is published by The Fafnir Bearing Company. It occured to us that the readers of MODERN MACHINE SHOP might find it interesting also, so here it is—"by permission of the copyright owners."

Putting Life Into Dead Dollars

Normally, we do a total business in the United States of between 80 to 90 billion dollars per year. And we do it with approximately five billion dollars of cash, which represents our total of money in circulation.

Thus, you see, each dollar makes about 17 round trips a year; in other words, each dollar in circulation does $17 worth of business.

This is why the recent report of the committee on unemployment relief lays such stress on the matter of hoarded money.

A short time ago, before the formation of the National Credit Corporation, it was estimated that one billion dollars had been withdrawn from banks and put into stockings, under mattresses, buried in the ground or placed in safe deposit boxes. Hoarded money.

That hoarded billion in cash on the basis of 17 dollars worth of business for each dollar in circulation represented seventeen billion dollars less business activity per year in our country. And seventeen billion dollars worth of business means approximately four million jobs.

None of us would like to think that we are personally responsible for a man being out of work and for his wife or children suffering from want. Yet every man or woman who is hoarding $235 is depriving some other man or woman of a year's work.

No one is asking us to spend our savings in order to bring back good times. But the President's committee is asking us to make our savings work for us and give work to somebody else.

New Shop Equipment

Hammond Strait-Line Automatic Polisher and Buffer

The illustration shows the latest addition to the Hammond line of automatic polishing and buffing machines — the Hammond "Strait-Line" Automatic Polisher and Buffer. The machine as shown is arranged for polishing and buffing the top and inside edge of a hinge or ventilator door as used on the hood of the modern automobile. The door is 4 x 12 in., and both the top and part of the inside edge of the hinge are polished and buffed in one pass across the machine. Production is 900 finished pieces per hour.

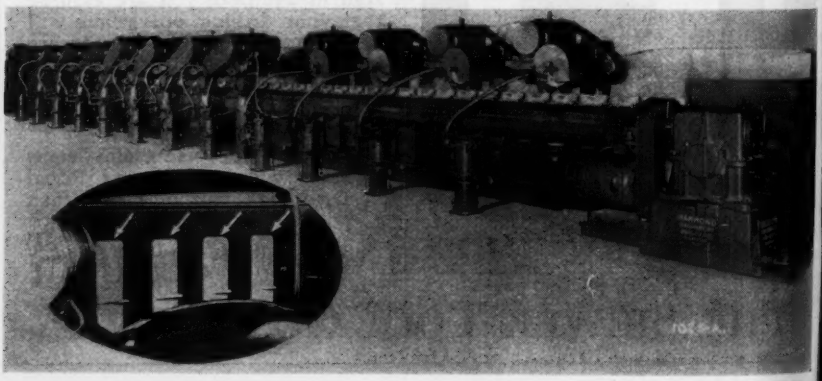
Any type of work not requiring a rotating work fixture can be processed on this type of machine, and the wheel can be set at any angle from horizontal to vertical. The machine is not limited as to width, number of wheels, or length. One of the outstanding features of the machine is the caterpillar type of conveyor unit, which is responsible for the remarkable work finish and speed. The cast iron platens which form the conveyor are machined as true as surface plates and are so heavy and well aligned that any type of fixture or adaptor may be attached. This construction permits side as well as top finishing. Platens are mounted on hardened rollers, chain-driven, and run on continuous rails. If desired, the speed may be varied by the use of the Hammond Variable Speed Multi-V Belt Drive.

As can be seen in the illustration, the polishing and buffing heads, of which there are twelve on this machine, are complete motor-driven units. They are Multi-V Belt driven and the speed can be varied either through a variety of sheave diameters or by Hammond Variable Speed Pulleys, by which the speed can be increased to 50 per cent of the low speed. But a few minutes is required for the change.

Spindles are equipped for independent oscillation, which may be applied or disconnected by means of a lever on the outside of the housing. Each head is mounted individually on universal knuckles. Heads are supported by vertical columns which may be raised or lowered. Equipped with a tilting adjustment, the wheel can be moved from the vertical to horizontal position. Both spring and weight balance controls provide for any predetermined pressure (or yield), giving the cushion effect so necessary for polishing and buffing.

The automatic composition feeders, recognized as the twelve cylinders at the front of the machine with flexible

Hammond "Strait-Line" Automatic Polisher and Buffer, as adapted for polishing and buffing automobile ventilator doors.

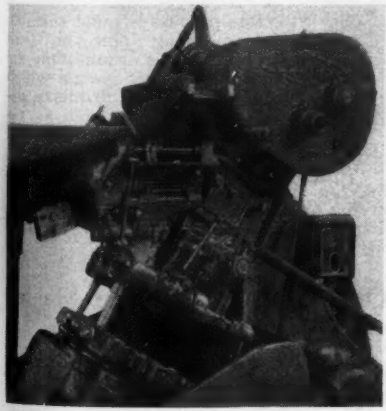


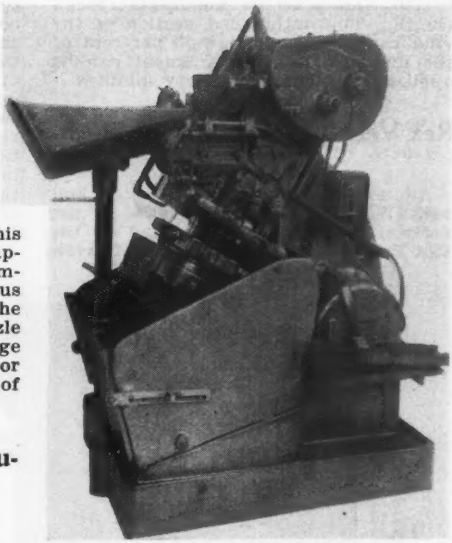
hose leading to the wheels, is a new development. It eliminates hand wheel lubrication with waste of material and labor and substitutes economy of both, coupled with maximum efficiency and cleanliness. It is operated by compressed air, the composition paste being delivered through a distribution nozzle to the wheel. The centrifugal force of the wheel, in turn, carries the composition to a fabric collector pad clamped to one side of the nozzle. This pad, contacting with the wheel-face, applies a definitely-controlled film of composition. Intermittent or continuous feed, as well as quantity, is under the operator's control. The feeding nozzle is equipped with an adjustable discharge spout, adjustable for flat, irregular, or curved contours as well as width of face.

Stud Attachment for Landis Automatic Forming and Threading Machine

The Landis Machine Company, Inc., Waynesboro, Pa., has developed a stud attachment for its ¾-in. Automatic Forming and Threading Machine which gives it a production rating of 200 to 500 per cent as a stud machine. This high rating is due to the fact that the loading (and unloading), pointing and threading operations are performed simultaneously at three separate stations.

Stud attachment for Landis Automatic Forming and Threading Machine.





Stud attachment in place on machine.

Another noteworthy feature of the attachment is its ability to handle sheared blanks. This unusual practice saves material, eliminates the more expensive cutting-off operations and reduces manufacturing costs to a new low level.

The attachment consists of a hopper and a magazine. An agitator located at the base of the hopper insures an orderly and uninterrupted flow of the blanks to the magazine. From the magazine the blanks are fed, one at a time, to a slot through which they drop into an auxiliary magazine. The auxiliary magazine is a sectoral chamber which positions the blanks for transfer to the loading station of the turret.

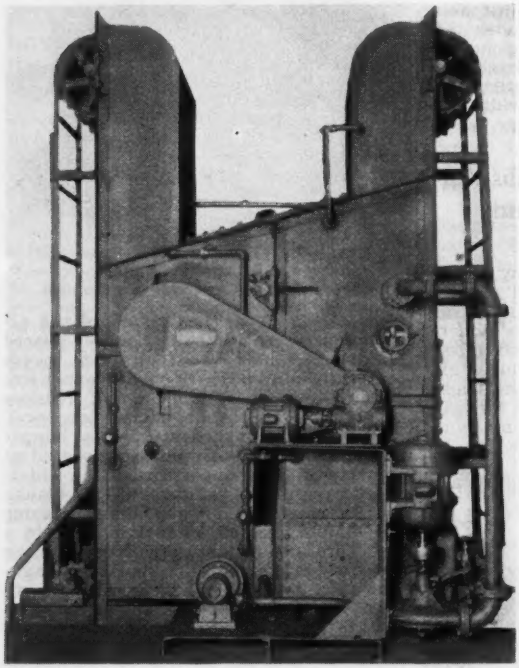
For the second operation, the semi-finished studs are stacked in the hopper with their blank ends at the front of the hopper. The front wall of the hopper is hinged and can be dropped to facilitate loading. The pointing head takes care of any variations in the lengths of the blanks and insures studs of uniform length. It will also point blanks of uniform length with the minimum amount of waste.

The attachment is a self-contained unit which can be applied to machines in service. It is adjustable and will accommodate studs from ¼ in. to ¾ in. in diameter, from 1½ in. to 6 in. in

length, and a 2½-in. maximum thread length. The unthreaded section of the stud cannot be less than 75 per cent of the diameter. The attachment can be applied and set up in thirty minutes.

Rex Vertical Type Solvent Washing Machine

An improved design of the Rex Solvent Washing Machine, known as the vertical type, is being produced by the Rex Products & Mfg. Co., 13005 Hillview Ave., Detroit, Mich. The vertical type solvent washer is a short-coupled vertical machine, and is recommended where floor space is very limited, or where it is desired to permit the operation of the machine by only one operator. One person is able to place the dirty work upon the conveyor, or fixtures, and then remove the clean work, which is returned to the operator.



Rex Vertical Type Solvent Washing Machine.

The cleaning solvent used in the machine is known as Perm-A-Clor, which is non-explosive, non-inflammable, is permanent in quality, and acid-free in both liquid and vapor form. In the machine illustrated, the work is placed upon the conveyor (with or without fixtures) at the right of the machine, upon which it passes downward into the machine between powerful streams of boiling solvent which strike the work at all directions at a pressure of 35 lbs. per square inch. The work may be removed from the conveyor at the left of the machine or pass under the machine and return to the operator for removal.

After the solvent in the pumping chamber has been contaminated with an accumulation of oil and foreign matter, the flow-back pipe from the rinsing chamber is shut and the distilled solvent is drawn off into a reserve tank until all of the solvent in the pumping chamber has been distilled or evaporated, leaving only a sludge and the accumulation of dirt in the pumping chamber. The dirt and oil are then removed and cleaned out of the machine by the removal of a plate on the pumping chamber. After the cleaning, the plate is again fastened to the machine and the clean, distilled solvent is drained back into the pumping chamber from the rinse and reserve tanks. The machine is then ready for operation with clean solvent. This method of cleaning, together with the condensers at the openings of the machine, keeps the loss of solvent at a minimum.

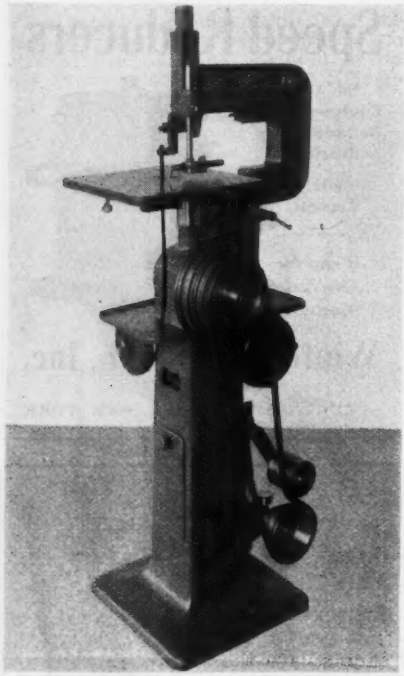
The process is most suitable for cleaning zinc or lead coated metals, aluminum die castings or soft metals which are affected by ordinary alkali cleaners, as well as removing lubricating oils from machined, stamped or quenched parts, or for removing buffing compounds, before applying paint, lacquer, enamel, plate, vitreous enamel or other surface coatings.

Oliver Model P-4 Die Making Machine

The Oliver Instrument Co., Adrian, Mich., has redesigned its Model P-4 Die Making Machine, shown in the illustration, to include a number of improve-

ments. The new model, as shown, is motor-driven with a V-belt transmitting power between two cone pulleys which provide for five changes of speed.

The machine is considered as a duplex machine, since it is equipped with special arrangements for holding either light or heavy files or saws. Clamps are provided, attached directly to the reciprocating rams, for holding the heavy parallel files. These clamps also hold adjustable clamps for the smaller files and saws. The clamps can be brought forward to simplify the process of inserting files and saws and they can also be adjusted vertically to permit the use of the shortest file or saw possible for the thickness of the work.



Oliver Model P-4 Die Making Machine.

The table is of heavy construction, is rigidly supported, and tilts in four directions. The working surface is accurately ground. The overarm is used for both filing and sawing, the upper end of the file or saw being clamped to the ram, which reciprocates in ample and rigid bearings or in the adjustable clamp referred to above. The upper ram is actuated through a bell crank lever and two heavy coil springs which impart proper and uniform tension to the saw.

The overarm may be swung away from the file to remove the die for inspection and brought back to the same position instantly when filing is to be resumed. The file need not be removed or loosened in the lower clamp for inspection of the die. No hold-down brackets, fingers, or file rollers are required. Hold-down fingers are attached directly to the overarm and the working surface of the table is entirely clear.

A saw magazine attached to the under side of the pan, which does not reciprocate, carries saw coils of various lengths that can be quickly adjusted for sawing out dies. The Model P-4 has capacity for sawing tool steel up to 2 in. thick, and will be found sufficiently large to meet the requirements of most shops. If desired, the machine may be furnished with variable stroke and mechanical feed. A screw-feed sawing attachment has been added which is rapid and accurate on both filing and sawing, and saw breakage has been practically eliminated.

This model can be furnished for motor drive, as shown, or for belt drive. Weight, approximately 400 lbs. Motor required, ½ h. p.

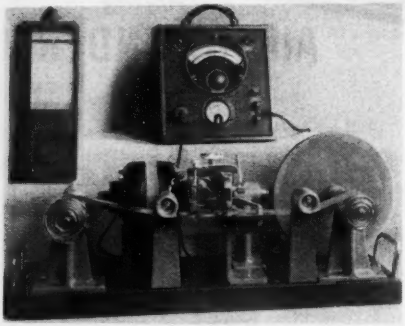
Application of P & W "Electrolimit" Gage for Continuous Inspection

In order to maintain uniformity of the product as it comes from the rolls, it is necessary, in the rolling of strip or sheet stock, foil, wire, paper, and so on, that the size of the material in process be known to the operator at all times. The Pratt & Whitney "Electrolimit" gage is now being applied to give the operator this information continuously and without shutting down the mill or machine.

The illustration shows an Electrolimit gage connected with a working model of a foil mill. The gage is mounted between the idler pulleys and the motor moves the foil from left to right through the gage in the same way that the foil would come from the mill.

Material of this general nature is usually gaged at some point between the

calendar rolls and the reel upon which it is wound. Idler pulleys such as those shown in the model provide a correct and constant elevation and the material passes between a gaging anvil of either



P & W "Electrolimit" Gage in use for continuous inspection. The instrument shown at the upper left can be used to maintain a permanent record of the size of the material.

the fixed or roller type and a gaging contact pointer of suitable design. The latter is one end of a lever, hinged at the center, and kept in contact with the foil by a constant spring pressure. The opposite end of the lever is in contact with the armature lever of the Electrolimit gage head. Thus any change in the thickness of the material is transmitted to the gage and then is magnified through the electric circuit and shown in easily-readable form on the indicating dials.

The large indicating dial on the instrument shown in the illustration is a micro-ammeter with a 5-in. scale. The standard magnification of the circuit will cause a 1-in. movement of the needle for each 0.0001 in. variation in the thickness or diameter of the material. This magnification may be increased or reduced by a simple adjustment.

Contacts can be placed in the circuit of the instrument to signal, either by light or sound, when the indicator pointer moves outside those graduations on the scale which represent the maximum and minimum limits of size.

A permanent record of the size of the material in process may be obtained by the use of the recording instrument shown at the upper left in the illustration. This instrument combines recording with indicating, as will be noted from the graduated scale and pointer.

The device operates on a 110-volt, 60-cycle current. A voltage regulator in the instrument reduces the error from line voltage changes to approximately one-millionth of an inch per volt change, which is negligible.

B & S Spiral Two-Lipped Straight Shank End Mills

A line of spiral two-lipped straight shank end mills has been announced by the Brown & Sharpe Mfg. Co., Providence, R. I. The greater cutting areas afforded by the spiral teeth make the mills unusually efficient on certain types of operations, adding to the life and productivity of the tool. The mills are furnished in high speed steel, both right and left-hand spirals, and are made in a complete range of sizes from ¼-in. to ¾-in. diameters.

B & S Spiral Two-Lipped Straight Shank End Mills

National "Type A" Boring Tool

A series of boring tools in which tungsten carbide cutting tools are used has been placed on the market by the National Boring Tool Co., 8619 Mack Ave., Detroit, Mich. The boring bar shown in Fig. 1 is typical of the series. This bar is intended for semi-finish and finish reaming and is designed to be run in bushings at both ends. The bar is built of nickel alloy, hardened and

Fig. 1—National "Type A" Boring Bar

chrome plated. The tensile strength of this bar is 160,000 lbs.

The cutter, illustrated at **A** in Fig. 2, is locked in position by two steel members, fitted together with multiple Vees or serrations. This construction prevents any tendency toward axial movement and assures absolute rigidity. An adjustment of one-third the diameter is obtainable by turning the adjusting screw indicated by the arrow.

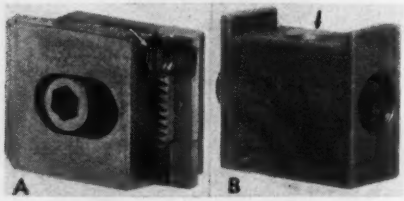
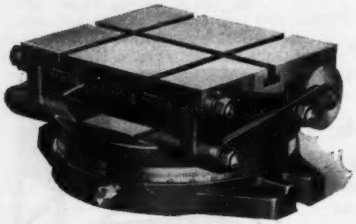


Fig. 2—(A) Cutter for Type A Boring Tool. (B) Fastening Member.

At **B**, Fig. 2, is shown the fastening member, or lock. A wedge actuated from one end by a setscrew forces out the stud, indicated by the arrow, and when the cutter and block are located centrally in the slot in the boring bar, it forms a perfect friction lock. This method of fixing the cutter in the bar forms a three-point suspension, eliminating any tendency of the bar to spring. The tool is built in capacities of from ¾ in. to 2½ in. inclusive.

T-P Adjustable Angle Plate

A rapid and convenient method of setting up angular work on the grinder, milling machine, shaper, or other machine tool is afforded by an adjustable angle plate that has been placed on the market by The Taft-Peirce Mfg. Co., Woonsocket, R. I. The plate consists of a tilting table, 8 x 10 in., hinged at one end to a substantial base that is rotatable on a sub-base fitted with holding lugs and a bottom key for securing to the machine table. The table and base are made of seasoned cast iron, ground to finish, and are well proportioned. The weight is approximately 75 pounds.



Taft-Peirce Adjustable Angle Plate

The rotating base is accurately graduated, which makes possible a convenient and quick set-up for machining compound angles. The tilting table can be set for ordinary purposes with the aid of a built-in protractor. Or, if extreme accuracy is required, sine bar buttons can be attached. Advantages of this fixture other than those already discussed include absolute rigidity, moderate weight, and unusual stability obtained by keeping centers of gravity of work inside the hinge point of the tilting table.

McCrosky Cone-Type Face Milling Cutter

In a new design of cone-type face milling cutter recently announced by McCrosky Tool Corporation, Meadville, Pa., serrated blades are locked in the body by a hardened lifting wedge. The semi-circular shape of this wedge and its position in the body in relation to the blades are shown in the accompanying illustration. The lifting wedge is brought into contact with the blade by a hollow headless set screw. This screw is not threaded into the body, but merely bears against the bottom of the wedge recess in the body. The screw forces the wedge up and over against the blade, this action in turn forcing the serrations on the blade into rigid engagement with the serrations in the slot in the body. The wedge has a large contact surface, and being semi-circular, it rocks to a perfect bearing against the blade. To release the grip of the wedge on the blades, it is only necessary to withdraw the screw a few turns and tap the wedge with a soft hammer.

The wedge and screw form a self-contained unit. The wedge is case-hardened to protect it from damage and to increase its length of service. Behind each blade is another hollow headless set screw which has a generous portion of its thread engaged by threads in the walls of the blade slot. This screw prevents the blade from being forced back, however severe the cutting strain may be, and it also provides an easy

method of adjusting the blades forward uniformly for regrinding.

The blades are set in the body at a steep angle in relation to the center line of cutter, the serrations on the blades being horizontal and parallel to the bottom. Moving the blades forward a very short distance produces a liberal radial expansion. Ample length of blade affords generous end movement for adjusting the cutters radially without changing the engagement of the serrations. Additional radial adjustments can be secured by stepping the blades out one serration, and this adjustment may be repeated for several serrations without sacrificing rigid locking of the blades in the body. As a result, 70 per cent of the blades can be worn away in actual use before the cutter has to be fitted with a new set of blades.

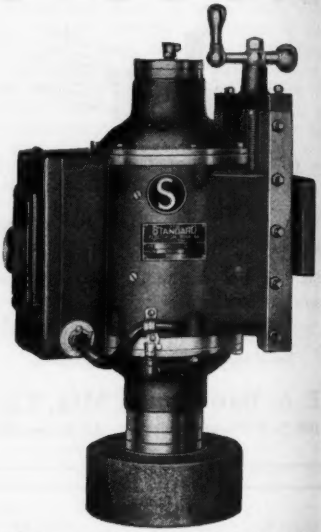
The cutter body is made from a high grade alloy steel and is case-hardened to prevent damage by chips or hard usage. Standard blades are made of high speed steel. Blades can also be furnished of Stellite or tipped with hard carbide metal.

Standard sizes of McCrosky cone-type face milling cutters for medium duty service range from 5 in. to 20 in. in diameter. Each size is designed with a large number of blades to insure excellent finish at high speeds. Special cutters with fewer blades and cutters with heavy-duty blades can be furnished to specifications.

McCrosky Cone-Type Face Milling Cutter.

"Standard" 4 H.P. Special Vertical Grinder

The vertical grinding machine shown in the illustration has been brought out by The Standard Electrical Tool Co.



"Standard" 4 H.P. Special Vertical Grinder

1940 West Eighth Street, Cincinnati, Ohio. The machine is especially adapted for die-grinding or other surface grinding, and is provided with a pad by which it can be attached to a planer or other machine tool.

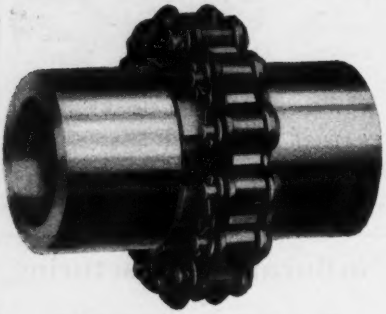
The machine is equipped with a cup wheel of 7 in. diameter with a 1¼-in. wall, and is powered by a special 4 h.p. General Electric 3,600 r.p.m. motor. Ball bearings are used, with a special bearing to make the end thrust. The machine as shown is provided with a vertical feed, but it can be furnished with both vertical and horizontal feeds if desired.

The machine is made in sizes of from 3 h.p. up to and including 10 h.p. The weight of the machine as shown is 15[illegible] pounds.

Cullman Flexible Coupling

A flexible coupling of such simple design that it is composed of but three parts is now being offered by the Cullman Wheel Co., 36 Altgeld Street, Chi-

cago, Ill. The coupling, shown in the illustration, is formed of two sections upon which sprocket teeth are cut, and a chain by which the two sections are



Cullman Flexible Coupling.

held together. The driving load is transmitted from the teeth of one member through the chain rollers to the teeth of the opposite member. Misalignment is compensated for in the rollers of the chain.

The two sprocket sections are milled from solid steel and hardened. The chain is flexible and easy to couple. No casing is needed. Power is transmitted through the rollers, although a certain amount of flexibility is provided. The coupling is light in weight when the strength is considered. The coupling is made in nine standard sizes, for shafts from ⅞ in. diameter to 6 in. diameter, and to transmit — at 100 r.p.m. — from 1.38 to 218.22 horse power.

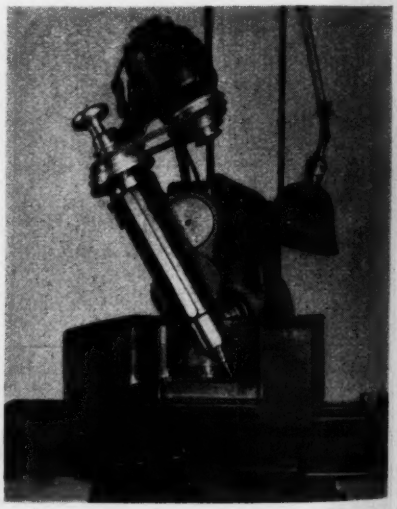
"NKB" High Speed Milling Head

The high speed milling head illustrated has been brought out by Neff Kohlbusch & Bissell, 2402 West Madison Street, Chicago, Ill. Powered by a ball bearing ½ h. p. 1725 r.p.m. motor, pivotally mounted through a V-section endless moulded belt and aluminum 4-step pulleys, the device has an available range of speeds of 800, 1400, 2400, and 4000 r.p.m.

A double pivot construction makes possible the positioning of the spindle to any angle, at any height within the scope of the two centers. Thus the cutter may be used at a point below the regular spindle of the milling machine and also at a point practically flush with the bottom of the overarm. Accurately-ground squaring surfaces, parallel to the spindle, provide for accuracy.

The spindle runs in four bearings that are mounted in a ground and lapped steel sleeve which lines the full length of the housing, the bearing mounting being such that changes in spindle length due to temperature changes are compensated for. The spindle is of tool steel, hardened and ground the full length, and will accommodate collets of ⅜ in. maximum capacity. Brackets to fit the user's requirements are furnished for either circular or the dovetail type of overarm.

The collets are designed with an extremely small included angle, giving a positive hold on the cutter, and the drawbar is mounted with a handwheel of convenient size, with a polished surface as a safety feature. A safety device is incorporated in the switch, which is placed near the spindle nose, making it impossible to apply current to the motor with the spindle locked. All electrical

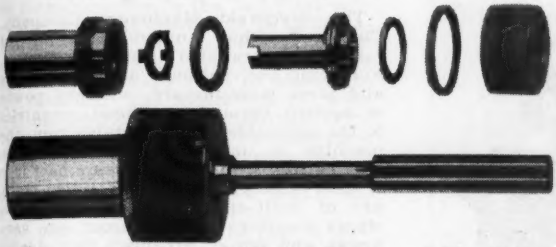


"NKB" High Speed Milling Head in operation.

leads are B-X encased. The machine is adaptable for rotary filing. The weight of the complete device, with motor, is 56 pounds.

Scully-Jones Short-Nose Floating Reamer and Tap Holder

A short-nose floating holder for reamers and taps is being offered by Scully-Jones & Company, 1901 South Rockwell Street, Chicago, Ill. Like the standard Scully-Jones Floating Holders, it can be used with automatic screw machines and turret lathes, but it is particularly designed for multiple hand reaming and tapping machines where the space is limited axially. Unlike the standard holder, the collet is withdrawn within the tool body, reducing the overhang as well as the overall length. This construction may be seen in the upper part of the illustration, where the tool is shown completely disassembled.

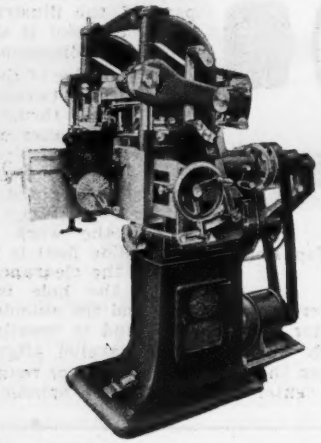


Scully-Jones "Short-Nose" Floating Reamer and Tap Holder, assembled and disassembled.

The shoulder of the collet floats between two sets of ball thrust carriers, the smaller of the two carrying the weight of the tools when the holder is mounted in a vertical position; the larger, the work reaction. Side float is limited by the clearance between the hole in the outer adjusting nut and the outside diameter of the collet, and is usually .015 inch. This permits parallel alignment when the hole being tapped or reamed is off center with the machine spindle.

"Thiel 32" Vertical Punch and Form Shaper

For the manufacture of irregular shaped punches or similar work, Marburg Brothers, Inc., 90 West Street,



"Thiel 32" Vertical Punch and Form Shaper.

New York, N. Y., have placed on the market in the United States the "Thiel 32" vertical punch and form shaper, which is a German machine. An ordinary cutting tool is used to produce one-piece solid punches quickly and accurately. The cutting tool after completing its downward travel swings back and thus produces the supporting shoulder for the punch. The radius is predetermined, with a minimum of ½ in. Radii and spacings are easily and accurately shaped by the aid of a dividing head. All adjustments are easily made from the right-hand side of the machine.

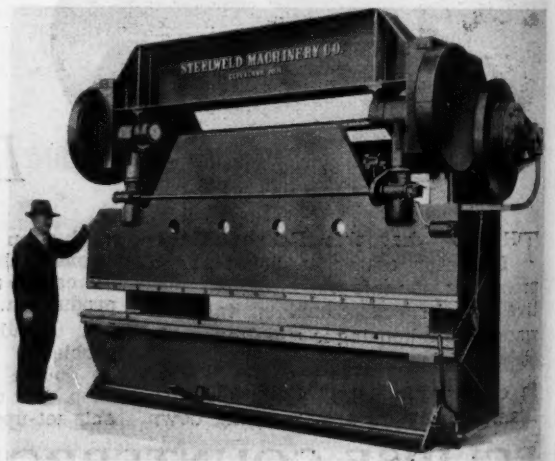
A quick-change gearbox provides three speeds, according to the type of the material, degree of finish, or length of stroke. The latter can be regulated from 1½ to 4 in. The power cross-feed has a maximum travel of about 8¾ in. and is adjustable from 0.006 to 0.017 in. in either direction. The planing width is 8¾ inches.

"Steelweld" Rolled Steel Welded Bending Brake

The Steelweld Machinery Company, Cleveland, Ohio, announces a line of rolled steel welded Bending Brakes. Following conventional design in brake and press manufacture, whereby power is applied through overhead eccentrics to the moveable and adjustable ram, the machine is unique in certain details. The housings, in place of being cast iron or steel castings, or cut from rolled plate, are of built-up welded sections. The stress members in the throat are very heavy and are so arranged that deeper throats can, with safety, be supplied.

Wherever practical, the manufacturers prefer to ship the machine whole, except the bed, claiming thereby to eliminate bolts and rivets and supply a simple monolithic all-welded frame of unusual strength and rigidity. In this machine, both the ram and bed are of ample depth and are overhung at one end, giving great advantage in jobbing work as well as longer die surface for narrow work.

The clutch is a Twin Disc. The operating levers move on ball bearings, eliminating much friction and reducing operator fatigue. It is claimed that the tool operates with unusual ease and



"Steelweld" Welded Bending Brake.

speed. All the gears in the machine are steel, the high speed gears being of Sykes Herringbone type. Ample bearing area is provided on both sides of the eccentrics, giving a double bearing to each gear.

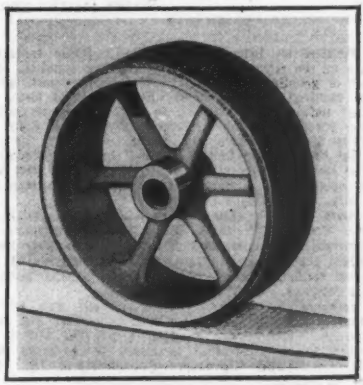
A feature of advantage is stressed by the manufacturers in the ball joint connection, which is claimed to be unbreakable in service. No ordinary cast iron is used in the tool, the slide bearings and eccentric straps being of Meehanite Iron castings. The flywheel is of rolled steel, mounted on Timken bearings. Flywheel shaft is a high carbon alloy steel with the pinion forged integral. Eccentrics are forged solid with the main shafts. Adjusting screws are heat treated high carbon steel.

The power elevation to the ram is electrically operated, self-locking and practically fool proof. The motor is arranged to stall before damage occurs to mechanism. The manufacturers equip the machine with pressure grease lubrication from a central location. Longer strokes, deeper throats, greater die clearances or width of bed and ram are readily obtainable, without delay in production.

Gripwell Pulley-Surface Covering

The injurious effects of slippage on a drive belt and the loss of power and increased wear and tear on equipment through the use of overtight belts in an attempt to reduce slippage are well known. To eliminate these troubles and to improve the efficiency of the belt drive, a covering for pulley surfaces has been developed by the Gripwell Manufacturing Co., 105 West 40th St., New York, N. Y.

The covering is made of Gripwell Cement, applied to Gripwell Duktex. The cement is a refined vegetable and oil compound of high tenacious power and the Duktex is a specially processed waterproof-treated canvas which, when applied to iron, steel, wood or paper pulleys, increases the tractive power.



Pulley Covered with Gripwell Pulley-Surface Covering.

The covering replaces the polished surface of the pulley with a semi-elastic gripping surface that is permanent. It is claimed by the manufacturers that Gripwell Pulley-Surface Covering is not affected by acids, steam, or climatic conditions.

It is stated that the use of Gripwell Pulley-Surface Covering makes it possible to run belts much slacker than is possible without it, reducing slippage, saving on the wear of the belts, and saving wear on the machinery and pulley bearings. It is said that slippage has been reduced to less than half of one per cent on drives where service is very severe.

For Your Catalog Library

Check any of these useful publications that you want, write your name, firm name, title, and address on the margin, then tear out the page and send to Modern Machine Shop, 128 Opera Place, Cincinnati, Ohio. They will be forwarded to you promptly without cost or obligation. Please restrict your list to not more than ten.

Pointers on Internal Grinding: A folder containing data on the selection of internal grinding spindles, selection of grinding wheels, methods of holding work, grinding bushings, grinding holes with keyways or slots, and other useful information will be sent free to any machine shop executive. Address Abrasive Company, Tacony and Fraley Streets, Philadelphia, Penna.

Cut Your Sawing Costs: "Lenox" hack saw blades and band saws are guaranteed to effect savings on your sawing operations. Write for information to American Saw & Mfg. Co., Springfield, Mass.

Ames Gages: Catalog No. 50, issued by the B. C. Ames Company, Waltham, Mass., contains complete descriptions and illustrations of the dial gages, gage heads, upright gages, cylinder gages, dial micrometers, and precision verifiers, special gages and attachments made by this company. Copy free upon request.

Scraping By Power: Bearing surfaces can now be scraped with a power scraper that is quicker and easier than the old-fashioned hand method. The tool is described in a folder that is issued by Anderson Bros. Mfg. Co., 1926 Kishwaukee St., Rockford, Ill. Sent free on request.

Steel Furniture for the Shop: The complete line of steel furniture made by the Angle Steel Stool Co., Plainwell, Michigan, including steel stools and chairs, steel foremen's desks, lockers, tables, tool stands, machine tenders, shop boxes and pans, iron bar racks, trucks, bench legs, and bench drawers, is described and illustrated in Catalog "C," which is issued free to machine shop executives.

Stop Tap Breakage: A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine & Tool Co., 200 Davis Avenue, Dayton, Ohio. Sent free upon request.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

Hold Odd-Shaped Pieces Securely: A vise in which odd-shaped work can be held securely without the need of special jaws or fixtures is described in a folder that has been issued by The Avey Drilling Machine Co., P. O. Box 487, Cincinnati, Ohio. Copy free upon request.

Greenerd Arbor Presses: Catalog No. 36, issued by the Edwin E. Bartlett Co., Nashua, N. H., describes and illustrates all the various types and sizes of arbor presses made by this firm. Copy free upon request.

Automatic Oiled Die Sets: The automatic oiled die sets, die shoes, punch holders, leader pins, bolster plates, bushings, and other standard die parts made by the E. A. Baumbach Manfg. Co., 1806 S. Kilbourn Ave., Chicago, Ill., are described in Catalog No. 5, which has been issued by that company. Sent free upon request.

Portable Flexible-Shaft Machines: Flexible-shaft machines of the latest design and built for heavy duty service are described in Circular No. 50, issued by The Binghamton Flexible Shaft Co., Maple Avenue, Johnson City, N. Y. Copy free upon request.

Buhr Multiple Drilling Equipment: Increase your production with a mutiple spindle head, fixture, and index table built as a single unit. Write for information to Buhr Machine Tool Co., Davis & Greene Streets, Ann Arbor, Michigan.

Mounted Grinding Wheels for use in small holes such as are found in bushings, dies, gears, tools, etc., are described in a catalog that has been issued by the Chicago Wheel & Manfg. Co., 110 S. Aberdeen St., Chicago, Ill. Copy free upon request.

Comtorplugs: Interchangeable plugs for internal gaging from .250 in. to 8 in. dia. and up to 24 in. in length graduated by an amplifier to .0001 in., are described and illustrated in a circular that has been issued by The Comtor Company, Waltham, Mass. Copy free upon request.

Motorize Your Cone Pulley Lathes: An attachment that can be applied to your lathe with four bolts makes it possible to motorize and modernize your lathes. Write for information to Cullman Wheel Co., 1336 Altgeld St., Chicago, Ill.

Flexible Couplings in which there are no screws, no bolts, no grease, no projections, and which run as smooth as a pulley are described in Bulletin 103-B, which can be had by addressing The Clark Controller Co., 1146 East 152nd Street, Cleveland, Ohio.

Gears Of All Kinds are described and illustrated with specifications, in Catalog 80, which has been issued by the Chicago Gear Works, 105-9 S. Jefferson St., Chicago, Ill.

Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Stephan Mfg. Co., Urbana, Ohio, including Desmond-Huntington, Desmond-Sherman, Zig-Zag, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

Steel Spacing Washers: Milling jobs can be set up quicker by using standard spacing washers, made by Detroit Stamping Co., 3445 West Fort Street, Detroit, Michigan. Write for information.

Interchangeable High Production Tools: Catalog No. 21 issued free by the Eclipse Counterbore Co., 7410 St. Aubin St., Detroit, Mich., describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

"Speed" Spot Welders for welding metals from 0.005 in. to 5/8 in. thick are described in a catalog that can be had by addressing Eisler Electric Corp., 761 South 13th Street, Newark, N. J.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, thickness gages, dial comparators, and other precision measuring instruments marketed by the Federal Products Corporation, Providence, R. I., are described and illustrated in a book that will be sent free upon application to this firm.

The Involute Gear Simply Explained: A direct, clear explanation of the theory and principles of involute gearing without the use of higher mathematics can be obtained without charge by addressing The Fellows Gear Shaper Co., 78 River St., Springfield, Vt.

Questions To Ask Before Buying a Jig-Boring Machine: A list of the fine points to look for in a jig-boring machine, with descriptions and illustrations of the working parts of the Swiss Jig Borer, can be obtained free by addressing The R. Y. Ferner Co., 1511 K St., N. W., Washington, D. C.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Tungsten-Carbide Tipped Tools: The boring tools, counterbores, form cutters, facing heads, reamers, spotfacers, and other tools made by The Gairing Tool Co., 1629 West Lafayette Blvd., Detroit, Mich., made with or without tungsten-carbide tips, are described and illustrated in Catalog No. 20. Copy free upon request.

Stampings of any kind or size can be obtained from Gerding Brothers, 5 East Third Street, Cincinnati, Ohio. Write for particulars.

Balance Your Rotating Parts: Rotating parts weighing from ¾ oz. to 2,000 lbs. can be dynamically balanced on a super-sensitive, high-speed balancing machine made by The Globe Tool & Engineering Co., 400 Davis Avenue, Dayton, Ohio. Write for information.

Ball and Roller Bearings, either journal or thrust, for all purposes and in all sizes, are described and illustrated in catalog No. 9 which has been issued by The Gwilliam Company, 360 Furman Street, Brooklyn, N. Y. Copy free upon request.

Swiss Files: The complete line of Grobet Swiss Files for use in die and tool work or for other fine work is described and illustrated in Catalog "K," published by the Grobet File Corporation of America, 3 Park Place, New York, N. Y. Copy free upon request.

Patent Service: Models will be built, machines designed, patents developed and obtained, and production machinery will be built by an expert, specialized organization. Write for information to D. M. Heller, 31 East 17th St., New York, N. Y.

Precision Bench Lathe Work can only be done on finely-built, accurate machines. The complete line of Hjorth Precision Bench Lathes is described and illustrated in a catalog that has been issued by Hjorth Lathe & Tool Company, 60 State Street, Boston, Mass. Copy free upon request.

Useful Tool Information: The Illinois Tool Works, 2503 N. Keeler Ave., Chicago, has published a catalog which describes and illustrates the standard and special cutters, mills, hobs, gear cutters, thread cutters, saws, reamers, and other tools made by this firm. The book also contains a number of useful tables and formulas. Copy free upon request.

Special Mil-Waukee-Mils of Standard Units: A milling machine of which the base, heads, columns, and other parts are built in standard units, thus enabling the user to order a machine that will be especially adapted for his job, is described and illustrated in Catalog No. 36, issued by the Kearney & Trecker Corporation, Milwaukee, Wis. Free to machine shop executives.

Threading Machinery: Catalog No. 32, containing full descriptions of Landis threading machines, stay bolt threading machines, bolt factory threading machines, automatic forming and threading machines and chaser grinders can be had without charge by addressing Landis Machine Co., Inc., Waynesboro, Penna.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

Save Your Diamonds by using the Diamond Point Angle Tool. Write for information to Mendes Cutting Factories, Inc., Charlevoix Bldg., Detroit, Mich., or 105 West 40th Street, New York, N. Y.

Compound Spot-Facing Tool: A spot-facing tool retracting, serrated roughing cutters and fixed finishing cutters in the same tool will break up the scale easily and do accurate work. Write for bulletin to Mummert-Dixon Co., 120 Philadelphia St., Hanover, Penna.

"The Answer to Your Gear Problems": Information as to correct methods of cutting and finishing gears will be supplied without charge by The National Tool Co., Cleveland, Ohio. This firm also carries a complete stock of gear shaper cutters and markets the National-Cleveland Spur and Helical Gear Grinding Machine.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

"Commercial Lapping for Close Limits and High Production" is the title of a booklet that discusses hand and machine lapping, types of lapping tools and machines, workholders for machines, preparation of laps, preparation of work for lapping and other important points. A copy may be had by addressing Norton Company, Worcester, Mass.

Die Making Machines: How dies, templates, gages, etc., can be sawed out, filed, and lapped easily and accurately on Oliver die making machines is fully described in a bulletin issued by the Oliver Instrument Company, 1430 Maumee Street, Adrian, Mich. Mailed upon request.

Good Vises Breed Good Work: Good bench work is impossible with badly-made or worn-out vises. The seven outstanding features of the Parker Vise are described in a bulletin that can be had by addressing The Charles Parker Co., Meriden, Conn.

"Fastenings" is the title of a booklet, issued by the Parker-Kalon Corporation, 192-196 Varick Street, New York, N. Y., in which are included the results of surveys made in fourteen different plants as to the efficiency of fastening methods. Copy free upon request.

Bench Lathe Mounting and Driving Equipment: Bulletin 120-A, issued by Rivett Lathe and Grinder Corporation, Brighton, Mass., contains complete descriptions and illustrations of modern and conventional countershaft, individual motor drive jackshaft, and speed box motor drive, also benches, cabinets, oil pans, etc. Copy free upon request.

Pullmore Industrial Clutch: A multiple disc clutch, made in two types, to run in oil or dry, and which is so built that it can be operated at high speeds, is illustrated and described in a folder that will be sent free by the Rockford Drilling Machine Company, Rockford, Ill.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Stamp Your Name on Your Product: Full information as to the steel roller dies, embossing dies, and embossing rolls made by the Schwerdtle Stamp Co., 10 Cannon Street, Bridgeport, Conn., can be obtained by writing this firm.

Push-Broaching With Modern Equipment: Modern methods of finishing holes by push-broaching are described in a booklet that is issued free by the Sheldon Machine Co., 3255 Cottage Grove Ave., Chicago, Ill.

Economies in Material Handling: A volume of facts about planned load handling, with actual examples of economies in time, material, and labor costs that have been effected with Shepard electric hoists will be sent free upon request to Shepard-Niles Crane & Hoist Corp., 424 Schuyler Avenue, Montour Falls, N. Y.

Rapid Drill Jigs: How time can be saved and drilling operations made easier by the use of a quick-acting drill jig is told in a booklet that is issued free by the Siewek Tool & Die Co., 10230 Woodward Ave., Detroit, Michigan.

Simonds Files: A useful book on files showing the various styles made, their uses, cross-section, and cuts, and containing a number of reference tables and other information useful in a machine shop can be had by addressing Advertising Dept., Simonds Saw & Steel Co., 470 Main Street, Fitchburg, Mass.

The Most Efficient Speed for the operation of special production units, power conveyors, and other machinery by the use of the WHS Speed Reducer and how it can be obtained is told in a bulletin that will be mailed free by Winfield H. Smith, Inc., 30 Eaton St., Springville, N. Y.

Speed and Accuracy in Straightening: The Springfield Straightening Press is an ideal tool for use in straightening any length or size of rough or finished work. Send for illustrated folder. Address The Springfield Machine Tool Co., 630 West Southern Avenue, Springfield, Ohio.

Cutting and Grinding Facts: A discussion of cutting oils and lubricants, together with descriptions and illustrations of various kinds of jobs upon which cutting oils are used, is contained in a booklet that is issued by the Sun Oil Company, 1608 Walnut Street, Philadelphia, Penna. Free upon request.

Tips for Torches: Standardized cutting and welding tips that are interchangeable with various types of torches

are now available. Write for catalog to Tips, Inc., 515 Cathedral Street, Baltimore, Md.

Check With Air: How time and labor can be saved by the use of air-operated chucks, cylinders, and other equipment is told in a book which describes "Hopkins" Air-Operated Equipment. Published by The Tomkins-Johnson Company, 620 N. Mechanic St., Jackson, Mich. Sent free upon request.

Change drilling speeds instantly without stopping the machine or touching a belt. This can be done with the Victor Super-Drill, made by U. S. Automatic Box Machinery Co., Newtonville, Boston, Mass. Bulletin free upon request.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 29, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

How To Measure Threads with Wires: Circular W24, issued by The Van Keuren Co., Watertown, Mass., tells how to obtain the correct thread pitch diameter with a micrometer and wires. Copy free upon request.

Tool Chests for Machinists and Toolmakers: The complete line of fine tool chests for machinists and toolmakers made by J. M. Waterston, 420 Woodward Ave., Detroit, Mich., is described in Catalog No. 25. Ask for it.

Double-Life End Mills: Wel-don double-end type end mills, made with blades on each end, are described in a circular that can be had by writing The Weldon Tool Co., 1426 West Third Street, Cleveland, Ohio.

Wrenches For Every Use: "Guaranteed Against Breakage" tappet wrenches, pipe and fitting tongs, offset wrenches, and wrenches for all other uses are described and illustrated in a series of folders which can be obtained without charge by addressing J. H. Williams & Co., Buffalo, N. Y.

Keeping Unemployment Score

(Continued from page 22)

the ground that it can be absolutely eliminated under proper management. Again, some types of unemployment-within-employment, such as that occasioned by vacations, are altogether desirable.

Assuming that we had unemployment scores for a number of different branches of the same enterprise, or for a number of different plants in the same industry, or from different industries, it would be possible for those making poor records to counsel with those securing better results.

Until we have developed a generally recognized method of taking off unemployment records, each employer will have to make for himself certain assumptions and adopt tentative rules. But a very little experimenting in any well-run establishment will make data now being regularly collected available for this purpose.

The unemployment record is nothing more than a reassembling of data usually available through methods current in well-run plants.

"Vim" Short-Center Drive Booklet

"Vim Short-Center Drives" is the name of a 148-page belt treatise that has been compiled by the engineering research staff of E. F. Houghton & Co., Philadelphia, Penna. It contains an entirely new treatment of efficient short-center drives, with charts, tables, and engineering data on 5,000 standard "Vim" drives ranging from 5 to 100 h. p.

The book was originally published for use by the Houghton technical field men, to assist them in working out transmission problems with engineers, and therefore is not for general distribution, due to the high cost of compiling the text as well as the printing. Copies will however, be delivered to executives and engineers who are directly interested in power transmission, who will send in their requests to the Houghton Company on their firm letterheads.

"Alumaweld" Metal for Welding Aluminum

A metal that will weld aluminum and other metals, including pot metal, die castings, cast iron and steel, has been developed by the Allied Research Laboratories, Glendale, California. The metal is called "Alumaweld," by reason of the fact that it breaks down the structure of the metal being repaired and fuses or welds with it to form a single piece.

Alumaweld has a tensile strength of 12,000 pounds, but is very ductile and will take a fine polish over which chromium or other plating can be applied. The primary melting point of Alumaweld is 370 degrees. Once melted, however, the secondary melting point is from 50 to 250 degrees higher, depending upon the time that the metal has been allowed to remain in the molten condition.

Alumaweld is applied to aluminum or die cast metal with either an ordinary soldering iron or a blow torch, and without flux. For cast iron and steel a special flux is required. Alumaweld is one of the few metals that will not corrode under ordinary circumstances, and there is no possibility of its rusting, because of its neutrality and the fact that it fuses with the metals to which applied.

By GEO. ALEXANDER MANN

When the wind blows about some flapperette's knees it's got somethin' to blow about.

She said "I want some powder,"
"What kind?" asked salesman Huff,
"The kind that goes off with a bang,
Or goes on with a puff?"

The saddest part about wars is they never kill off those responsible for 'em.

Forget the short sellin'—it's the short buyin' that wrecks us.

Some Sense o' Humor

"My scrap with her
Was funny," said Pitt,
"When she threw that ax
I thought I'd split."

Who'd ever thunk that soft drinks would bring hard times?

'Tis now admitted that war doesn't pay. But gosh, Mel, how it does collect.

Ossifer—Call a Cop

We've been to different states,
An' here let us explain
You'd have to feed us poison
Before we'd go "ptomaine."

Not So Dumb

Reservin' for a rainy day
Some say's a lotta bosh,
But our steno she's engaged,
His name is Mackintosh.

You're not flattering the security salesman these days when you tell him his word is as good as his bond.

It takes the present day Janes to get down to cases—"vanity," "cigarette" and "divorce."

Troo Enuff

One sure way to bust
Friendship bubbles,
Try to make your friends
Share your troubles.

We wouldn't care how much advertising they'd pull over the radio if they'd just advertise for some he-man announcers.

Why Liz—How Turrible

Liz sez it ain't half as bad fer a man to lead a double life as it is fer a gal to lead a single one.

Sis walks with a slouch,
Says Billy so wise,
'Cause she can't get
No other guys.